

N. J. HIGHWAYMAN

1921-1922

# The Highwayman

The Highwayman is Out  
For More and Better Roads  
in New Jersey

August, 1921  
Vol. I  
No. 1



## Hold Up!

Here I am.

Who I am, and for what purpose here, you'll soon know.

First of all though, what is a highwayman?

Why, of course, *a man who uses the high-ways.*

As such, *you* are vitally interested with me, in the hold-ups I am going to make.

You're my partner: no less!

You have an investment, a permanent investment, that you have to add to every year, in the State's highways.

How is that investment being looked after? Who's watching your interests there? Is your State keeping up with others in the matter of *good roads*? And, more important still, what's the outlook for safe and comfortable riding when you have a trip to make?

These, and similar questions, I'm going to try to answer for you.

I'm going to hold things up, to hold them down.

I'm going to keep you posted on road affairs in your state—where the best routes are; where new roads are being put in and when they will be ready for your use; what detours to take when the usual lines of traffic are temporarily blocked for repairs or new work.

Furthermore, I'm going to ask you to come right along with me and look "inside the works". To see just how the dollars which *you* are spending for roads this year are being handled?

You ought to know some of the boys who are doing this work! You would find it mighty interesting to follow any of them through a day's work. There are so many of 'em now, that it's kind of difficult for them even to keep in touch with each other—that's one reason why I'm going to get around among them, and let the whole Highway band know who's doing what; and how it's being done.

In short, I'm out for good roads—*your roads*. I'm going to hold you up once in a while, to tell you the truth, as far as I can gather it, about Roads in New Jersey.

And it's up to you to hold up my efforts, by taking an active, intelligent interest in the road programme of your State;—to hold up that programme, or be held up by an inadequate road system and unsatisfactory road maintenance, because *no public service can achieve success except to the extent that public opinion backs it up.*

So it's up to you to hold up the good roads movement in New Jersey!

To help you do that, by keeping you informed on roads, is my mission.

If you like my looks—now that we're introduced—introduce me to your friends.

Let's make little old N. J. as famous for her roads, as she is for her gardens! 'Till we meet again, Yours,

*The Highwayman*



# The Highwayman of New Jersey

## The Highwayman

Published Monthly By The  
State Highway Department, at Trenton, N. J.

### The Highwayman Makes His Bow

With this issue, "The Highwayman" makes his bow, to you, the General Public.

His first object is to build up the double barreled spirit of co-operation and healthy competition within the big and growing Highway Department itself.

But—it's *Your* Highway Department, and so what the Highwayman comes across in his travels is just as interesting to you as it is to those in the Department.

If you are interested—send in your address and we will mail you each issue, as it's published.

#### What's Coming?

In the next issue we will give a description of the new method of testing concrete construction as it's being built. Also an account of the new method of preventing overloading of trucks, which has already caused hundreds of thousands of dollars worth of road damage. And, for your personal convenience, up-to-the-minute information on detours, road construction, etc.

There will also be published the names of the Maintenance foremen and their gangs that show the highest efficiency in co-operation between the Maintenance and Equipment Divisions.

#### Let Us Hear From You

We want your comments and suggestions for "The Highwayman". Maybe you have a snapshot that would be of interest to other highway users. Let's have it. Anything is grist for "The Highwayman's" mill that will help toward

"MORE AND BETTER ROADS IN NEW JERSEY".



### "Follow the Arrows"

The other day Mr. Wasser, State Highway Engineer, got a long letter of complaint from a poor tourist who'd got lost on local detours; and asking if something couldn't be done about it. On all State road work, detours are "blazed" as shown above. If your county or township fails to mark detours properly, call the matter to the attention of the proper authorities.



"Tom"  
Wasser

### Your State Highway Engineer

Meet Thomas J. Wasser.

He's the man directly in charge of both the construction and maintenance of your roads.

Tom Wasser's experience with roads and road building has been long and strenuous. (For that matter, it would be hard to think of anything in connection with Mr. Wasser that wouldn't be strenuous!)

Early in the nineties, with the B. M. and J. F. Shanley Co. of Newark, engaged in macadam and telford road construction he had his first experience. From then on, with Sanford & Stillman Co., contractors and bridge builders, and with the R. W. Hunt Co., he was actually engaged, much of the time as engineer in charge of construction, on road work in Hudson County, and on the Lincoln Highway. From '13 to '20, he was County Engineer for Hudson County. In 1920 he was elected by the reorganized State Highway Commission to be State Highway Engineer.

To see Tom Wasser in action is to think of the remark made by a defeated opponent of Danie! Webster when he was asked what he thought of the man: "Sir, he is not a man, but a steam-engine in breeches!"



### "Wait A Minute Till I Take Me Coat Off!"

The light of publicity's a wonderful thing!

Just as we'd got the camera range on this group the big guy noticed us, and began to scramble out of his coat, so he'd show up better along side his fellow workers! They are not sweeping the drive on a gentleman's estate, but hand-brooming pot-holes, preparatory to repair work, on Route 6, near Woodbury, N. J.

George  
Lee  
Burton



### The Chairman of the State Highway Commission

When Governor Edwards picked George Lee Burton as chairman of this new State Highway Commission, he doubtless had in mind not only his natural ability to take hold of such a job vigorously, but also the training he had had would fit him for the work.

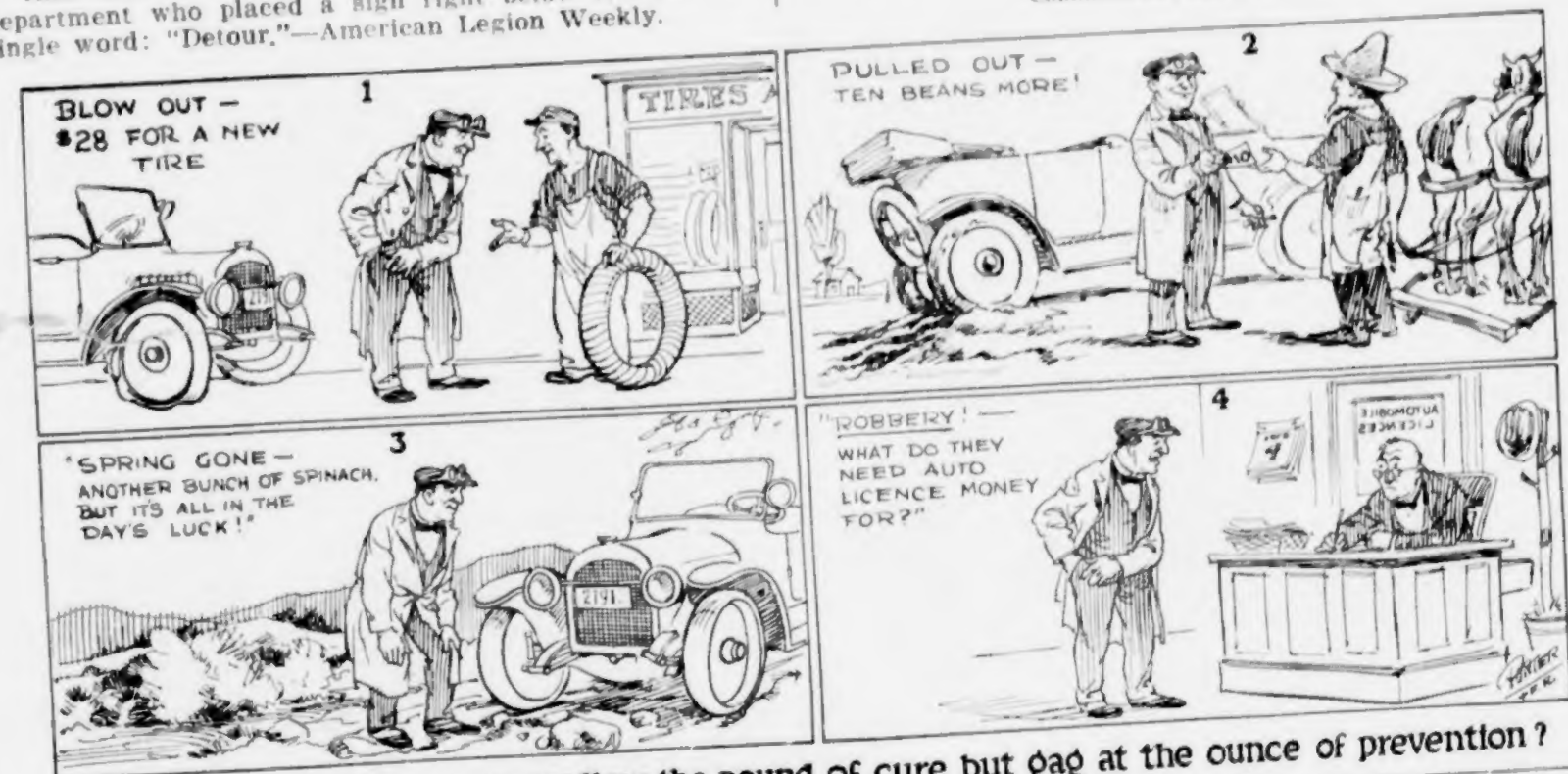
While Mr. Burton is still a young man, he has been actively connected with public affairs for a long time. He was elected special counsel to the Board of Health of the city of New Brunswick way back in 1912. He has also served as a member of the Assembly, and as county counsel for Middlesex.

Under Mr. Burton's able guidance in the chair, the present Highway Commission finds itself able to function well that speed, and efficiency which is possible only with a real "business administration."

#### DOES THIS HIT YOU?

An evangelist had tacked to a tree at the intersection of two roads a sign bearing this advice: "Prepare to meet thy God".

And then along came a man from the state highway department who placed a sign right below it with the single word: "Detour."—American Legion Weekly.



Gosh, don't it beat all how we swallow the pound of cure but gag at the ounce of prevention?



Brunswick Pike near "Penn's Neck." A "blow-up" on a six-foot fill, due to poor drainage.

### Highway Drainage

BY HARRY ROBBINS

Division Construction Engineer

A question that concerns every highwayman—thought few give it any thought—is that of "drainage". Poor drainage is a frequent cause of pavement failure; but it is not so easy as it might seem always to provide good drainage.

Drainage as usually understood is the removal of gravitational water. Ditches are used to remove surface water, and sub-drains to carry off ground water. The removal of surface and ground waters, however, does not always mean that the sub-grade will be dry. A sandy soil holds water, which will "drain out" readily, but some soils actually absorb water, and retain it most persistently. Much of the water so absorbed is moved by capillary attraction, which is influenced by drainage systems.

The exception is where the drainage system has lowered the level of the water so far that capillarity cannot lift the water into the sub-grade. Where water is so raised and held it may be sufficient to render the subgrade soft and yielding. The effect of this under frost action and heavy traffic can readily be seen.

#### When Is a Drain Not a Drain?

Clay soils, when saturated, drain very slowly, if at all. The clays comprise a great percentage of

(Continued on Page 4, Column 1)



## ALONG THE ROAD



### Did YOU Ever Try This?

After a strenuous week at the office have you ever tried this prescription for recuperation?

Just as soon as you get home Friday night or Saturday noon, don some old fluds, pack up bacon and coffee, and other camping eats, see that the camping outfit is all aboard, and then pile the family into the old boat and beat it for the hills!

First off, you stick to the broad highways, laying the miles behind you as fast as you can; but by sleeping time you've switched off on a good dirt road, and have found a spot by some bubbling hillside stream, canopied o'erhead by friendly trees and lit only by the far off head-lights on the Milky Way.

Oh, Boy! If the smell of that bacon and coffee isn't the best medicine you ever struck, I'll eat my oldest flannel shirt, patches and all!

[Continued from Page 3]

our sub-grades. Where they are encountered the benefits of tile or other drains are in many cases problematical, for the moisture they retain renders them plastic and yielding for a long period after every protracted wet spell. Drainage under such conditions is well nigh impossible.

Often road designers indicate drainage in the



There's a place like this within two or three hours of you. Why not look for it Saturday?

### Concrete Philosophy

BY CORDUROY IKE

Don't "take a chance" at Railroad Crossings—you can't buy a return ticket from Eternity.

...  
If the Guy-Behind is bound to pass you—let him go—better a few minutes of dust on the highway than several hours of ether in the hospital.

A smooth surface may make a fine "first impression"; but unless it's got guts back of it, it won't stand the traffic. That goes for both highways and humans.

...  
Play safe always; but play doubly safe in traffic. You can take a chance on your car, but you never can tell what the other fellow is going to do!

...  
Don't cuss the traffic cop just from force of habit. Did you ever try standing on concrete in the broiling sun all day, with a lot of fool drivers trying to steal by after you signaled "STOP"?

"cuts" and none in the "fills", when perhaps it was the fill that needed draining and not the cut.

Many of our roads have doubtless failed thru "improper drainage". Careful study of subsoil conditions before and during construction, and thoro investigations as to the cause of failures, will go a long way toward avoiding road ills.



BEFORE

You know what it is like to plow through a road like this on low—



AFTER

And how it feels to hit one like this. Do good roads pay? Figure up your gas bills!

Route 3—Hammonton-Ancora

## The Highwayman

The Highwayman is Out For More and Better Roads in New Jersey

September, 1921  
Vol. I  
No. 2



### After the Overload Truck Bandits

Since the Auto Truck Scales have been built at East Paterson, Newark, Trenton, and Camden, approximately 250 vehicles per week have been weighed by the Motor Vehicle Department. Approximately 75% of the trucks weighed are found to comply with the law and rulings of the Motor Vehicle Department.

The 25% which are found overloaded range from 1,000 lbs. to 19,000 lbs. overload. The majority of overloaded trucks are from within the State. More overloads have been detected around the City of Newark than have been found at any of the other scales locations.

The average overload ranges from three to five tons. Many trucks are overloaded five, six and seven tons. In some instances trucks are so overloaded that the springs are pressed down so that the load rests on the axle, the tires being flattened out so that the entire unsprung load is transmitted through the flanges of the wheels to the road.

The above information supplied by Motor Vehicle Commissioner, Wm. L. Dill, makes it apparent that roads could not be built to stand the gross conditions of overload found without bankruptcy to the State. However, Commissioner Dill states that the checking up of trucks is now having a decided effect in preventing overloads.

Many cases have been found where motor-truck owners have mis-stated the capacity of their trucks in order to secure lower license fees. The weighing at irregular intervals at trucks at various points in the State is causing licenses for greater loads to be taken out, thereby increasing the revenue to the State. In addition to the additional revenue from this source, Commissioner Dill estimates that \$10,000 will be taken in fines this year. The matter of increased revenue is, of course, secondary to the saving of our roads through the construction of the scales.

In addition to those mentioned above, Berington scales will be built at Phillipsburg and Jersey City, capacity sixty tons. These scales were secured from surplus war materials of the United States Government. After considerable difficulty in trying to select a suitable site for the scales in Phillipsburg, which is a very hilly town, the Town Commissioners have solved the problem by permitting us to build on their property on South Main Street. Work was commenced June 21, 1921.



Checking 'Em Up—To Save Your Roads



### Allow Me!

Say you, Gentle (?) Reader!

When I pulled a gun on you last month and he'd you up, I said I was going to introduce you to the State Highway Department.

Now, if you're a road user (and who isn't that is anybody?) I know you've cussed "the lumpy lanes of N. J." until your breath gave out and your collar button very nearly punctured your Adam's apple.

But it is one thing to cuss, and another to construct. What d'you ever do to help your little old State have a foot of better road?

That is none of your business, you say.

But hold on a minute; it is your business—because you're spending money for it. That being so, you ought to have at least a reading acquaintance with the men who are laying out these funds for you. I am introducing you to some of them, and to their work, this month, and you will hear more of them in future issues of the Highwayman.

It is surely so, that the more you know about roads, the better roads your State will have. Just send your name into the Highway Department at Trenton, N. J., and I'll hunt you up once every month and introduce you to some new member of the Highway Band; and also keep you posted on detours all over the State.

The Highwayman

(\*Like H—!)



# The Highwayman of New Jersey

## The Highwayman

Published Monthly By The  
State Highway Department, at Trenton, N. J.  
The *Highwayman* will be sent free upon application to  
any citizen of New Jersey who is interested in  
"More and Better Roads For New Jersey!"

### THE HIGHWAYMAN

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WALTER F. WHITTEMORE	Newton
THOMAS E. COLLINS	Elizabeth
ALBERT S. L. DOUGHTY	Mt. Holly
CHAS. F. SEAROOK	Bridgeton

### Keeping the Contractors Keeping Their Contracts

Every time a much-used road is torn up for repairs or re-building, it costs you—the State's road users—thousands of dollars in extra mileage, loss of time, and temper.

And of course every day such a job is prolonged, adds to your losses.

In order to have every road job completed at as early a date as possible, a *daily* report is sent in on each job, showing exactly the progress made.

And once every week, at the regular meeting of the Highway Board, each job is checked up; and any contractor who is not keeping up to schedule is sent a letter or a wire, and the "reason why" investigated.

### Jerry Juggles with a New Centre Joint

Edward T. Osborn, better known to the Highway world as "Jerry", has been working with a new type of centre joint down on the Route 6 (Shirley-Bridgeton) job. Jerry now has the joint straightened out to his satisfaction. The last daily report from Jerry on this job showed 1038 lined feet laid in one day. Over a mile was laid in the week—a record for concrete paving in the State.

### Give Your Friends a Tip on "Road Tips"

How do you like the *Highwayman's* detour service? Enclosed with this issue, you'll find the second "Road Tips" chart. If you find it a convenience in traveling, why not tell your friends about it? They'll thank you for the tip.

Telegram:  
Western Union  
Trenton, New Jersey—Editor *The Highwayman*: Gage is gun-shy—can't get his photo for *Highwayman*. Excessive modesty has kept him from ever permitting his picture to be used anywhere, any time—sorry cannot help you out.—Edward

[See last page]

A "word picture" of R. B. Gage—"the watch-dog of the Highway Department."

### Concrete Facts vs. Calyx Cores

BY R. B. GAGE

*Chemical Engineer*

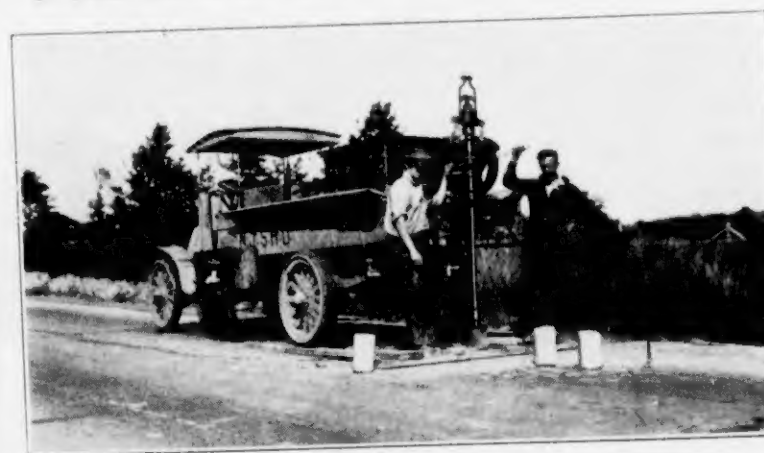
There are two methods of proving whether a paved road has been constructed as required by the specifications, and will be satisfactory.

The first method is based on assumption; the other on actual testing. This testing is made possible by a new machine called the Calyx Core Drill, which is equipped to bore a "core", several inches in diameter, out of the newly constructed road. This makes it possible to determine exactly the quality of the work being done.

The "assumption method" assumes the pavement has been properly constructed, since all materials used therein were of an assured quality. Also the reputation of the contractor is at stake. Moreover the contractor is required to guarantee the pavement for a definite length of time. But such a guarantee is of doubtful value so far as improving the quality of the work or protecting the interests of the public is concerned.

During the construction of bituminous pavements, samples of the finished pavement are taken of each day's work. The thickness, density, and composition of the pavement is secured from these samples. Errors in construction can thus be quickly corrected. Unfortunately samples taken from a concrete pavement, before it has developed a certain strength, are of little value for testing purposes. It is very difficult to take them after the concrete has developed the required strength. Consequently it has been necessary to have cubes cast from the concrete used in the pavement at definite intervals, cured in a given manner, and tested when they are of the proper age.

It has been doubtful whether these cubes constituted a satisfactory check or correctly represent the quality of the pavement. Also, defects have appeared in concrete pavements which could not be explained from the cubes taken. If these defects are to be eliminated, the causes that pro-



The "Calyx" drill, which takes the guess out of road testing. It will save taxpayers hundreds of thousands of dollars



John Ferris, of Jersey City

Here is one more of your Highway Commissioners

When Governor Edwards picked his new Highway Commission, he aimed to get, above everything else, *practical* men to take charge of the State's expenditure of some \$3,000,000 per year for road work.

In the selection of John Ferris, of Jersey City, he got a man who is not only practical, but of broad and sound public vision as well. Mr. Ferris, who was born in Ireland, has been a contractor in Jersey City for the past twenty-five years. He has engaged in many important public improvements; and is at present a member of the Jersey City Board of Education.

Mr. Ferris' services have been a valuable asset to the Commission.

duce them should be determined as soon as possible. With this object in view, a Calyx Core Drill outfit was purchased by the Department, and has been in operation some time. With the above outfit, a six inch (6 in.) concrete core can be secured from a pavement with little difficulty. This method requires a well equipped laboratory and an efficient staff of testing engineers and chemists, yet, the total cost incurred thereby is nominal compared with the losses caused by pavements failing prematurely.

The data secured so far has shown the wisdom of not permitting the coarse and fine aggregate to be dumped on the sub-grade, for evidently a great deal more of this sub-grade material got mixed with the aggregates during handling than was generally thought possible. This sub-grade material frequently is very deleterious; also, the effects of the concrete by permitting it to be dumped on a muddy, soft sub-base has also been noticed in the samples taken.

Again the irregularity in the contour of the sub-base is shown quite plainly by the cores. The accompanying photograph shows this very distinctly. There is a variation in height of nearly four inches (4 in.). This waste of material does not necessarily effect the cost of a given



Cores 1 to 5 from Sec. 3, Route 13; No. 6 from Sec. 1, Route 13. (Rule is 15 in.) Nothing can be "put over" on the Calyx Core drill!

### The Slogan

"If you won't be beat, you can't be beat,"  
That is the slogan true  
That Johnny Poe gave a football team,  
And we give it again to you.  
"If you won't be beat, you can't be beat,"  
They may leave you dead in the dawn  
On the blood red field that you would not yield,  
But your spirit goes marching on.

### The Highwayman's Honor Roll

Under this head, from month to month, it is our purpose to mention the men in this department who have done "exceptionally well" at their work, and as a result have been considered worthy of commendation.  
Mr. M. A. Cutley, Supervisor of the Northern Division, reports the following as Honor Roll men for the condition of their equipment.

<i>Foremen</i>	<i>Chauffeurs</i>
John P. Lawless	William Crangle
Thomas Arrastibia	Andrew Tuohy
Charles Marino	Henry Conkelton
Fred Yannut	<i>Rollermen</i>
Frank Coe	John Johnston
	Donald DeGraw
	Herbert Whitesell

Also Mr. Abraham Johnstone, Supervisor, reports the following:

<i>Foremen</i>	<i>Chauffeurs</i>
J. Herbert Fithian	Jone Canard
William Johnson, Jr.	John Shassler
	Harry Foster
	James Gibe
Douglas Cox	Leon Campbell

### Famous Sayings of In-Famous Highwaymen

R. B. Gage, Chemist:—"County Engineers do not know what is in their own specifications."

Chas. Fishberg:—"One of our men left the examination room when he saw the paper that he was to write on had a blue line down the center. Said he could not write on that kind of paper and gave up."

J. A. Williams, Div. Eng'r:—"Heard of one inspector who claimed the specifications had been changed on him, inquired if they were going to use trap rock, or crushed stone."

Also of the man who reported that they had done a nice job on the macadam face, but were throwing dirt on it from piles alongside the road.

G. R. Moore, Asst. Rt. Way Eng'r:—"Do not believe in deep side ditches. One of them came up, struck my car, and bent the front axle."

contract, but will increase the cost of future contracts, however. When the Department is doing the work and purchasing the materials direct, this waste of material is a dead loss and should be prevented.

It is the intention to study the drainage conditions of the sub-base when they are subjected to the most adverse conditions, consequently, the openings made in pavements, where the drainage conditions appeared defective, are only temporarily closed, so that the sub-base conditions can be easily determined at any desired season of the year.

In conclusion we have every reason to believe that very valuable data will be secured with this Calyx Core Drill, that will enable the Department to correct some of the defects in construction that have appeared in pavements constructed in the past.



## ALONG THE ROAD



**CAUGHT AT LAST!**  
R. B. Gage—author of the article on page 2. D'ye think you'd like to try pulling his leg if you were a Road Contractor?

### Making 'Em Safer

One of the greatest concerns of the Highway Department is that of *Making Road Travel More Safe*.

Every possible precaution is taken to reduce the "margin of safety" that is dependent upon the "human element" in road traffic.

One big improvement has been the use of signs which can be seen at a much greater distance than those previously employed, and capable of giving night service.

The new department signs, like the ones shown above, will help every one but the manufacturers of *break-linings*!

### "Oh, for a Lodge"

Not a senator, but a *quiet* one—"a lodge in some vast wilderness" as the poet put it.

Haven't you ever felt that way yourself? Wished you were a millionaire, with a camp in the Adirondacks, and all that?

Well, you don't need money to have just as much fun.

An auto-tent, a camp stove, the old buss—and a little spot where the leaves are green and the water gurgles and the world and its ways are a million miles away.

And maybe the old pipe isn't fragrant and soothing, after the bacon and coffee! No wonder the Indians called em *peace pipes*!

Where's your favorite camping spot? Send us a Kodak of it for the next HIGHWAYMAN!



"Where leaves are green and water gurgles."



One of the Department's new portable accident and brake-band savers

### A Streight Tip

If you would rise to larger pay  
And put your work across  
Just be the man you'd like to hire—  
If you were now the boss.  
—Toronto Telegram.

### Concrete Philosophy

CORDUROY IKE

A short-sighted financial policy never produces long stretches of good road.

I have "week-endel" in the famous camping places of the hard-worked rich—and I've had a darn-sight better time under a piece of canvas by an un-known streamlet.

If you insist on SPEED you'll get it—sooner or later, in the neck.

Statistics show more accidents on good straight roads than at bad curves. A word to the wise is sufficient—once in a great while!

If Sherman had ever traveled one before he made his famous remark about war, he would have saved it for detours!

While you're swearing at the detours, give a thought to the new hard surfaced road you'll have to glide over next month.

# Road Tips



## MONTHLY BULLETIN OF DETOURS

Adopted by the New Jersey State Highway Commission  
August 31, 1921

All detours posted with signs and blazed with "Arrows"  
(Color signals to right will be used along all State roads as soon as possible.)

### ROUTE NO. 1—Rahway-Elizabeth: Union County

From St. George Avenue or Route 1 through Milton Avenue, Rahway, to Irving Street, thence to Elizabeth Avenue thence to Stiles Street, Linden, thence to Edgar Road, thence to Washington Avenue, Elizabeth, thence to South Street, thence to Rahway Avenue, or Route No. 1.

### ROUTE NO. 3—Ancora-Atco: Camden County

Via Old White Horse Pike, between Ancora and Atco. New road to be opened October 1.

### ROUTE NO. 4—Red Bank-Eatontown: Monmouth County

Leaving Red Bank via Pickney Road, Oceanport Avenue to Little Silver, Little Silver to Oceanport to end of concrete pavement leading to West Long Branch.

### ROUTE NO. 4—Absecon-Smithville: Atlantic County

Via Pitney road, Absecon to Port Republic.

### ROUTE NO. 5—Budd Lake to Hackettstown: Morris County

Not necessary to detour. New construction is completed along line of the old road. Present construction being along new right of way.

### ROUTE NO. 5—Hackettstown: Morris County

Short detour adjacent to town because of bridge construction.

### ROUTE NO. 6—Mullica Hill-Bridgeton: Gloucester, Salem, Cumberland Counties

Leaving Mullica Hill via Commissioner's Road, through Lincoln and Daretown to Aldine; then east on Shirley-Elmer Road, a distance of about two miles; then south on Burlington Road to intersection of Route 6; following Route 6 to intersection on Finley Station Road, then turn on Finley-Station Road to the intersection of Deerfield Turnpike (the present detour) then to Bridgeton. Effective September 15th.

### ROUTE NO. 6—Woodstown-Salem: Salem County

South bound traffic through Woodstown via Sharpstown to Pointers and Salem. North bound traffic Welchtown via Fenwick to Woodstown.

### ROUTE NO. 8—Sussex-Unionville: Sussex County

Not necessary to detour, as the present road will be kept open and maintained for traffic during construction.

### ROUTE NO. 9—Perryville to West Portal: Hunterdon County

Via Clinton, Glen Gardner, Hampton, Asbury, West Portal.

### ROUTE NO. 10—Arcadian Way to Fort Lee Ferry: Bergen County

Not necessary to detour as entire construction is over new right of way.

### ROUTE NO. 12—Denville-Parsippany-Pine Brook: Morris County

Denville, Tabor, Morris Plains, Morristown, Whippany, Hanover, Livingston, Essex Fells, Pine Brook.

### ROUTE NO. 12—Phillipsburg to Port Colden: Warren County

Phillipsburg, Bloomsbury, West Portal, Washington, Port Colden.

This color (blue) on posts or signs indicates that road is running North and South

Red shows that it lies East and West

While yellow tells you that it takes a diagonal course

## For You— "The Highwayman"

Do you use roads? Do you want to know where they are being built, and what detours to take, each month?

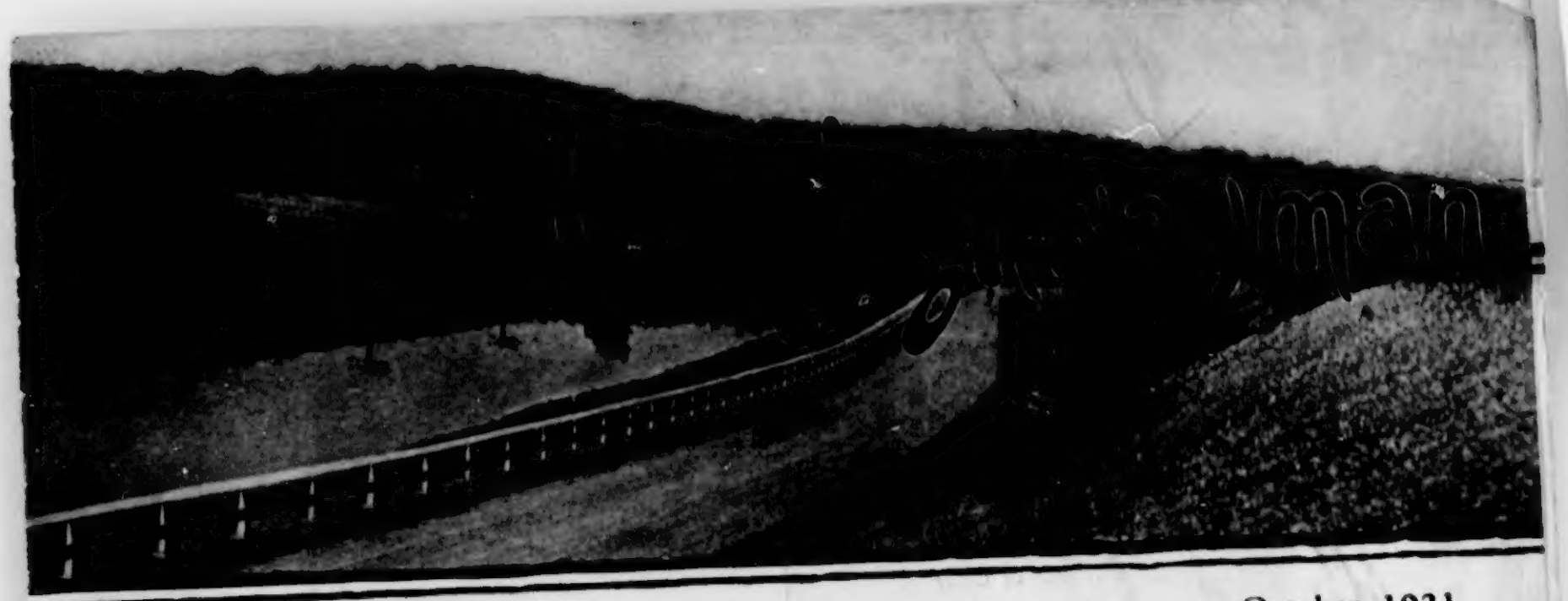
Then send, TODAY, to

**The Highwayman**  
New Jersey State Highway Department  
Trenton, N. J.

Just ask to be put on The Highwayman's list. A postal will do.

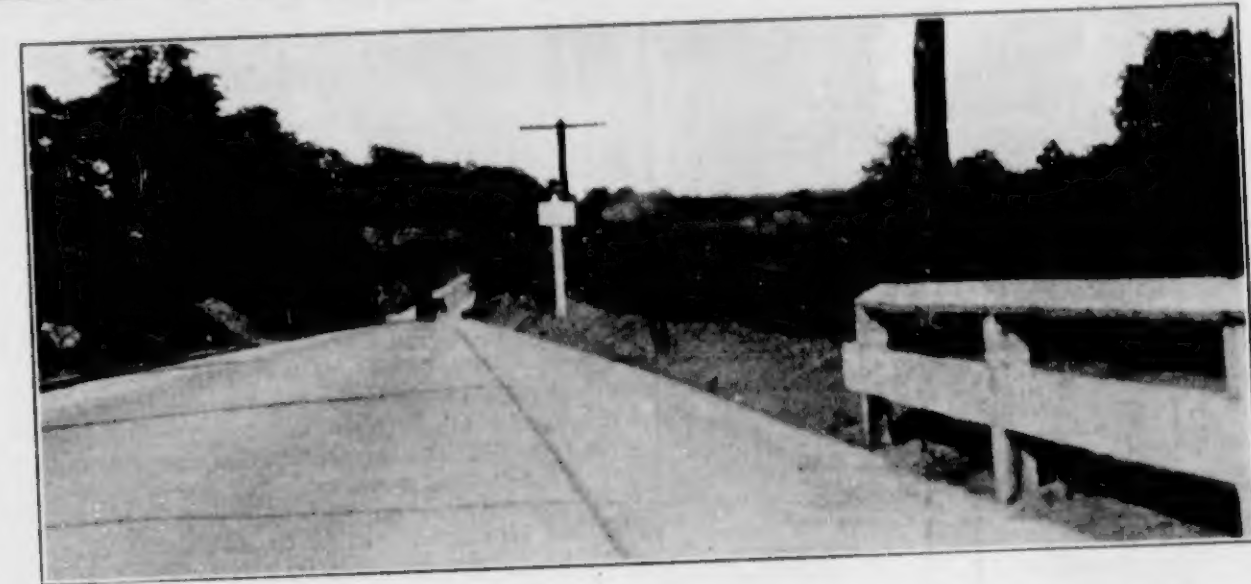






## The Highwayman is Out For More and Better Roads in New Jersey

October, 1921  
Vol. I  
No. 3



### The Challenge

Behold, you Knights of the Steel-rail; come forth and answer the challenge!

I speak for Highway-men, everywhere, high and low. From the road patrol to the chief Engineer; and from New Jersey to California.

The Nation's products must be transported. Must be kept moving. The raw materials from the farm and the mine to city and factory; and the finished product back again to the farm and the small town.

The means for that circulation constitute the very arteries and veins of our national life.

But we've been having sclerosis—hardening of the arteries!

What's wrong?

Once in a while,—when I get in from the road, I see a paper. And by the papers I see that the railroad managers, and the railroad men, and the Interstate Commerce Commission, all blame each other for the condition that exists.

But the people—the plain guys who *do business*—can't sit around twiddling their thumbs and wait interminably while you-all settle your arguments.

Either you folks have got to get together and get your rolling-stock rolling again somewhere down on a level with other lines of business, or the Nation's traffic is going to roll over highways.

That's not a boast on our part. It's just a statement of flat-footed facts. Road transportation, by truck, or stuff that should be moving by freight, constitutes one of our biggest problems right now.

The highways should be *feeders* for the railroads. But they can't keep on feeding, while the R. R.'s have indigestion! We *don't want* to handle the stuff that should be going by freight. We hope that a lot of the trucking that's been done represents a temporary condition.

But if you're going to force it to be permanent, then we'll have to take care of it in—and on—a durable, permanent way!



He sure  
got my goat!

### Get Out of the Bus and Meet Some of the Boys

Say, maybe I didn't get mad the other day.

For a second-hand wad of chewing-gum, I'd have shot up the whole darn town! Got lassoed into a lunch at one of those swell clubs, where the bird in the coat-room wanted me to check my spurs, for fear I'd mar the polish on the floor.

One member of the company got my goat. His front name was Percival. He wore one of those sweet little *mustachios* you could cover with a revenue stamp. And an overcoat that looked like it was made to discover the North Pole in. He must have been the original model for the tailor-made sport in those Springfield-Kelly tire ads! "No wonder our roads don't lawst", drawled this specimen.

"The men they employ to build the roads don't know how to *work*. They're only bums and ruffians. I saw a gang of them the other day—a very rough looking lot, I'll say! They cawn't know how to work."

"Work!"—Say I'll bet a quart the nearest that insect ever came to *work* was cheering for his side at a polo game!

Of course the boys who build your roads are a rough looking lot! You get out and level wet aggregate or dump batches in a mixer skip all day, and see whether you look "smooth".

And in these mixer gangs who are netting the country with threads of concrete, you'll find as good workmen as you find anywhere. Many of 'em are artists at their work; they take as much pride in turning out a good *road*, as you do in turning out a good product in *your* business.

Try this:—*next time you get near a road construction job, stop your car long enough to go take a look at the job.*

If you don't feel repaid for your trouble, next time we meet I'll treat the bunch. 'Till then—



You know  
his kind!

*The Highwayman*



# The Highwayman of New Jersey

## The Highwayman

Published Monthly By The  
State Highway Department, at Trenton, N. J.  
The HIGHWAYMAN will be sent free upon application  
to any citizen of New Jersey who is interested in  
"More and Better Roads For New Jersey!"

### THE HIGHWAYMAN

THOS. J. WASSER, Editor in Chief

#### Assistant Editors

A. LEE GROVER R. B. GAGE  
C. F. BEDWELL EDWARD E. REED  
CHAS. FISHER

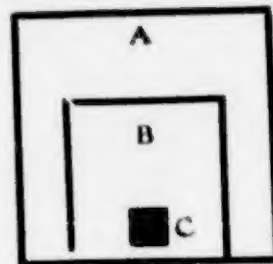
#### Managing Editor

F. F. ROCKWELL

#### State Highway Commission

Governor EDWARD I. EDWARDS, Ex Officio

Hon. GEO. L. BURTON, Chairman	South River
JOHN FERRIS	Jersey City
GEORGE PADDOCK	Newark
WALTER F. WHITTEMORE	Newton
THOMAS E. COLLINS	Elizabeth
ALBERT S. L. DOUGHTY	Mt. Holly
CHAS. F. SEABROOK	Bridgeton



### Roads vs. Scrap Iron

A=2,890 millions for interest, pensions, and other expenses arising from past wars.  
B=1,348 millions for Army and Navy (preparations for future wars).  
C=85 millions for public works of all kinds.

Above is our National Mad House A. B. C.  
The figures represented show that we are spending this year a total of 4,239 millions of dollars for scrap-iron; and 85 millions for public works of all kinds.

It may be that while others are building bigger and bigger navies, and maintaining big armies, we have to do it, too.

But the fact remains that WAR is costing us, as well as all other nations, a sum that is out of all sane proportion to our other expenses.

A modern battle-ship, fully equipped, costs about \$20,000,000. That is only the "first cost". And in a few years, it's literally nothing but scrap-iron.

The entire annual appropriation from State, County and Township sources for road work in this state is around \$15,000,000. Of course, only a part of this is for new road construction; and only a part of this part is for hard-surfaced roads, the cost of maintenance on which of course, is very much less than for ordinary dirt roads.

If we can do away with, or even cut down,



Albert S. L. Doughty

Our redoubtable Colonel Doughty has been a conspicuous figure in State affairs for a long period. Getting his early training as a traveling salesman, he has for fifteen years been engaged in the coal and lumber business.

For several years Mr. Doughty was under-Sheriff of Burlington County. In 1917 he was named by Governor Edge as a member of the Board of Managers for the State Home for Girls and served as president and treasurer of that body.

Upon the recommendation of the State Highway Commission Colonel Doughty was appointed to the new commission by Governor Edwards. Until December he was the only South Jersey representative on that body, having jurisdiction in highway matters over all the territory south of Middlesex County. In politics he is a Republican.

Some one has said that the Col. has a 'brow like Mark Hanna's and a jaw like Jack Dempsey's', at any rate, like both those gentlemen, he's noted for putting things through. Just recently, the Colonel has taken on a "general manager"—much to the relief of all the young men about Mt. Holly, who stood little show while the Colonel was still at large!

### To Advertisers A Very Important Notice

When the HIGHWAYMAN started out, a couple of months ago, in the interest of "more and better roads", the question of advertising space naturally came up for discussion. It was decided that no advertising would be carried.

Since the appearance of the August and September issues, however, we have found it necessary to increase our size in order to give to the public all the road information which is wanted.

Furthermore, a number of our good friends, substantial and reliable supply companies and contractors, have asked for space to tell their story in the HIGHWAYMAN.

So, beginning with the November issue, we will have a limited space for advertisers. Accounts for 12 insertions only will be accepted. We reserve the right to select type, etc., for "set up" of advertisements, to keep them in conformity with the general appearance of reading matter in the HIGHWAYMAN.

To advertisers who are interested we will be glad to quote rates, upon application.

the WAR burden, you can imagine what it's going to do for ROADS.

It's worth thinking about. It's worth working for.

And Furthermore, it's YOUR business. YOU pay the bills for both roads and scrap iron!



Dear Tom—Your darned "Highwayman" has held up everybody in the office.—McC.

### A Cackle from McClave

(With the usual apologies to K. C. B.)

Dear Tom:  
We have seen  
That YOU  
Have now become  
EDITOR.  
And are publishing  
THE HIGHWAYMAN.  
The TITLE  
Is good  
But it means  
TWO things.  
Now,  
If your paper  
IS O. K.  
And does NOT  
Tell you  
To HOLD UP  
People,  
We WOULD LIKE  
To have you  
MAIL IT to us

REGULARLY,  
To our  
Cliffside, New Jersey,  
Address.  
Also, TOM,  
We have seen your  
STATE AID  
Specifications  
And like them  
IMMENSELY.  
We would be glad  
To keep  
A copy, or TWO  
ON FILE  
In our office  
IF you can spare  
Them.  
YOURS,  
Until the  
ROOSTER lays—  
An egg.  
McCLAVE & McCLAVE  
By B. Duncan McClave.

### Boys—Just Notice What is Said About the EATS!

No! The Highway Association is not dead!!

It is hereby decreed that all members of the Band shall assemble at Camp Edwards, Sea Girt, N. J., on Saturday, October 15, 1921, there to meet in friendly contests of various kinds, not omitting an eating contest.

Earl Storer will act as a committee of one for the arrangement of athletic events, and he requests that all members of the Band who are ambitious to compete in any standard form of athletics communicate with him (in care of the Maintenance Division, New Jersey State Highway Department, Trenton, N. J.) at the earliest possible moment, stating what they think they can do, either in running, jumping, baseball, football, or other sports. If anyone can get together a baseball or football team, please make arrangements to do so, and notify Mr. Storer so that a suitable team can be found to compete with. Any suggestions along this line will be welcomed if promptly sent in.

G. R. Moore will act as a committee of one in charge of eats and refreshments. As soon as arrangements are perfected and the cost determined, this information will be forwarded to members of the Band.

J. J. Tyman will act as a committee of one in charge of transportation, and he will also communicate with the members of the Band at a later date, giving the details of arrangements for transportation.

Fail not of attendance under penalty of missing a good time.

Signed: ALEX. W. MUIR, President.

### NEW JERSEY STATE HIGHWAY DEPARTMENT December 1st, 1920

#### Executive

Hon. EDWARD I. EDWARDS, Governor

The State Highway Commission

and

THOMAS J. WASSER, State Highway Engineer

#### ADMINISTRATION

A. LEE GROVER, Secretary and Chief Clerk

M. L. HOWELL, Chief Auditor and Accountant

CHAS. FISHER, Assistant Chief Clerk

MISS GRACE WILLIAMSON, Chief File Clerk

R. W. WILDBLOOD, Purchase Clerk

#### CONSTRUCTION DIVISION

C. F. BEDWELL, Construction Engineer

R. A. MEERER, Right of Way Engineer

C. A. MEAD, Bridge Engineer

C. A. BURN, Supervisor of State Labor

ROY MULLINS, Northern Division Engineer

H. D. ROBBINS, Central Division Engineer

J. A. WILLIAMS, Southern Division Engineer

#### MAINTENANCE, EQUIPMENT AND PROJECTS DIVISION

EDWARD E. REED, Assistant State Highway Engineer

A. W. MUIR, Superintendent of Maintenance

N. C. APPELGATE, Superintendent of Equipment

A. D. BULLOCK, Projects Engineer

H. C. SHINN, Engineer of Special Assignments

#### TESTING LABORATORY

R. B. GAGE, Chemical Engineer

J. G. BRAGE, Senior Testing Engineer

F. H. BAUMANN, Senior Testing Chemist

### They Never Lay Down!

Mary had a little Hen,  
Out on her farm you know,  
It mattered not where Mary went,  
That Ford was sure to go!

Mr. A. W. MUIR,  
Supt. of Maintenance, Trenton, New Jersey.

Dear Sir:—I herewith submit the names of the following whose equipment is in unusually good shape:  
Foremen  
Chauffeurs

Carr	Simon	Titsworth
McMahon	Jacob	Titsworth
	Reed	
	Evior	
Beach	King	
MacDonald	Cotter	
Pittenger	Gray	
Stone		
Stout		

In connection with the above I have mentioned only the men whose equipment is not only in good mechanical condition, but also of good appearance outwardly. But if any names are to be inserted in the HIGHWAYMAN I believe some mention should be made of men who have kept in good mechanical conditions, equipment, which on account of age and previous hard usage, it has not been possible to keep of good appearance outwardly. Along this line I would mention the following:

#### Roller Men

Mitchell, Buffalo Pitts Rollers No. 10014.

This roller was one of the first three purchased by the Department in 1913, and was used on construction work for some years.

#### Chauffeurs

Ucho, who has kept a Heavy Aviation in continuous service all season with very few calls on the Equipment Division.

Hildebrandt, who has kept a White in service so far this season.

Very truly yours,  
JOHN J. STANLEY, Supervisor.



# The Highwayman of New Jersey



For every \$1.50 that is spent for roads, \$2.60 is spent for tires.  
ROADS are an investment; tires are not.

## Tires Cost More Than Roads

Did it ever occur to you that the 260,000 motor vehicles registered in the State of New Jersey, including trucks, would spend approximately \$26,000,000 per year on tires alone? Compared with this enormous cost for tires, the road-bed over which the vehicles go, that is to say the roads and highways of the State, receive an expenditure of about \$15,000,000 yearly. This \$15,000,000 includes new construction and maintenance of state, county, and township roads.

The total value of motor vehicles in the state probably exceeds \$300,000,000. The valuation of the railroads in the State of New Jersey is approximately \$372,000,000. The railroads invest in roadway or track, bridges, and so forth, a sum several times in excess of the cost of its rolling stock. The original cost of the construction of roads and highways, not including city streets, is approximately one-half of the value of the motor vehicles which use them.

Investors in motor vehicles, individually and collectively, could profitably consider the importance of roadways in the same sense as managers of railroads do. Millions have been spent by railroads to lessen grades, flatten curves and use heavier rail because the cost of fuel, depreciation on equipment, maintenance of road beds, and labor saved equaled such an amount that it paid a good return on the money invested in these improvements, in addition to giving far superior service and safety.

If improved or smoother pavements would save one-tenth the tire bill of the state per year, the amount saved would approximately equal the amount raised yearly by the direct state tax of 1 mill per dollar. There are no figures available from which we might approximate the saving of time due to better roads, but we can readily see that this item alone would amount to a gigantic figure.

Improvement of grades lessens the fuel bill considerably. Taken collectively this would also amount up into large figures. There are unlimited opportunities for a statistician to delve into the matter of costs in this connection. We have indicated a few of the possibilities.

—H. C. SHINN,  
Engineer of Special Assignments.



The material-handling plant erected for the Budd-Lake Job where

## War Left Overs

By

C. A. BURN, Supervisor of State Labor

At the close of the World War the War Department had large quantities of surplus equipment, including trucks, industrial railway and road building machinery. By an act of Congress, this equipment was turned over to the U. S. Agricultural Department for distribution to the several States for use in highway construction. Among the equipment received by New Jersey and used to advantage on the Budd Lake Job by the State Labor Forces were Nash Quad, Heavy Aviation, and Federal trucks, 25 in. industrial rail, Koppel dump cars, 24 in. gauge Plymouth Gasoline Locomotive, Hoisting Engine, Stiff Leg Derrick, etc.

Illustration No. 1 shows 3-ton Heavy Aviation truck, which the Highway Department had equipped with a Heil dump body, being loaded by the steam shovel in Smith's borrow pit. As the illustration shows, large quantities of rock were encountered in this pit, and, considering the character of the excavation and the roads which we had to haul over, these trucks gave very good service.



Illustration No. 1

Illustration No. 2 shows 2-ton Nash Quad, equipped with 2-ton Heil dump body, dumping material in McFadden's Swamp. These trucks have excellent tractive power, and were able to operate on days when it was impossible to move loaded rear drive trucks, but, on account of the rough hauling conditions and their complicated mechanical construction, they required considerable repairing.



Illustration No. 2



Illustration No. 3

## Help Build Roads

Illustration No. 3 shows Plymouth Locomotive hauling 10 Koppel cars from the shovel pit. This method of excavation permitted us to operate on days when it would be impossible to operate with trucks or teams. There is another advantage in that after the excavation is completed the truck can be used to haul concrete materials.

A topographical survey of this site was made, and it was decided to design a plant which would permit sand and gravel to be dumped directly into the bins, or dumped so it could be placed in stock piles by the clamshell bucket and derrick.

Illustration No. 4 shows the complete operation of the material handling plant. A truck has completed dumping a load of gravel into the bins. The clamshell is filling the sand bin from the stock pits. A train of 7 cars, with the sand bin from the stock pits. A train of 7 cars, with two 1-yd. batch boxes on each car, is receiving its load of sand and gravel from underneath the bins through four



Illustration No. 4

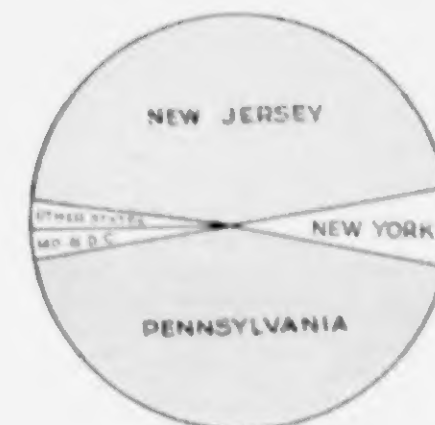
Hunt gates controlled by two men, while the front end of the train is being loaded with three bags of cement to each batch box. The time required by this method to completely charge each batch box with the proper amount of sand, gravel and cement is from 5 to 7 minutes for a



Illustration No. 5

7-car train, hauling 14 batch boxes.

Illustration No. 5 shows the train on its arrival at the mixer. Three men, not including the fireman, are required to handle the box, one on the off-side of the train to attach the yoke hook and help place the box on the car when



Census of Traffic, by States, over New Jersey Roads

New Jersey, 45 per cent.; Pennsylvania, 44 per cent.; New York, 6 per cent.; Maryland and District of Columbia, 2 per cent.; All other states, 5 per cent.

## Famous Sayings of In-Famous Highwaymen

You don't have to get your portrait painted nowadays in order to be done in oil.—*Motorist*.

COL. WHITTEMORE—Ratified, Approved and Confirmed.

TOM WASSER—Do it now.

Ed. Reed—Is your report ready?

LEE GROVER—Sure, I will do it for you.

JACKIE HAGIN—That certainly is swell.

NORM APPELATE—We can let you have a blivver.

GRACE WILLIAMSON—That must have been filed when I was away on my vacation.

ALEX MUIR—Hello! (said like a dog bark) Yes, this is Muir. (This seems to be his main line of conversation).

TOM WASSER (To H. C. Shinn)—Red, on the street, that attracted your attention indicates dangerous curves ahead. Watch your step!

emptied, and two to swing and empty the box and replace it on the car. The mixer fireman handles the raising and lowering mechanism, in addition to firing the mixer. The time required to lift a box from the car, swing it over the skip, dump and replace it on the car is from 25 to 35 seconds for each box.

The equipment used in handling and transporting the concrete aggregate from the plant to the mixer, at the present time a distance of about 2 miles, is three 7 car trains drawn by 3-ton Plymouth locomotives, a 3 drum hoisting engine, and a stiff leg derrick with a 48 ft. boom and a 3/4 yard clam shell bucket.

The maximum day's run up to the present writing for an 8 1/2 hour day has been 273 ft. of 6 in. x 8 1/2 in. x 20 ft. pavement with 56 lb steel wire reinforcing, and a steel I. construction joint, together with the installation of 10 steel dowels at each transverse joint.



surplus army supplies, and State Labor have been effectually employed.



# The Highwayman

# of New Jersey

## "Time"

An editorial by C. F. Seabrook, in "The Seabrook" reprinted by request

There is more of time than of any other thing in the universe,—oceans of it, without shores, without a bottom. And yet time is the one thing in the world you can least afford to waste.

It is the one thing that is eternally slipping away from you—that you cannot hold, grip it as you will.

It is the one thing you can not possibly get more than your share of—you can't buy, borrow, beg, or steal an atom of it.

The only thing you can do with TIME is to use it. You have things you want to do, in your business, in your home.

Time is the raw material, the only material, you can whittle them out of. What will you do between three and five this afternoon, between seven and ten tonight, be-

tween nine and twelve tomorrow morning? Will you mould and hammer those raw chunks of time into something concrete that will remain; or that will further your purpose to some future end?

Or will all that splendid raw material merely slip by you—like a river past a moss-grown, rotting pier—gone beyond all possibility of your use, forever.

Get quick! Press what you can from the passing hour, the speeding minute—the TIME is sweeping by in a torrent, it's burning up like a blazing oil well. And all the hours of all the yesterdays of a life time, won't furnish raw material enough to build a house of cards.

The time that's passing between your hands now, is the only time you can use. Make much of it!

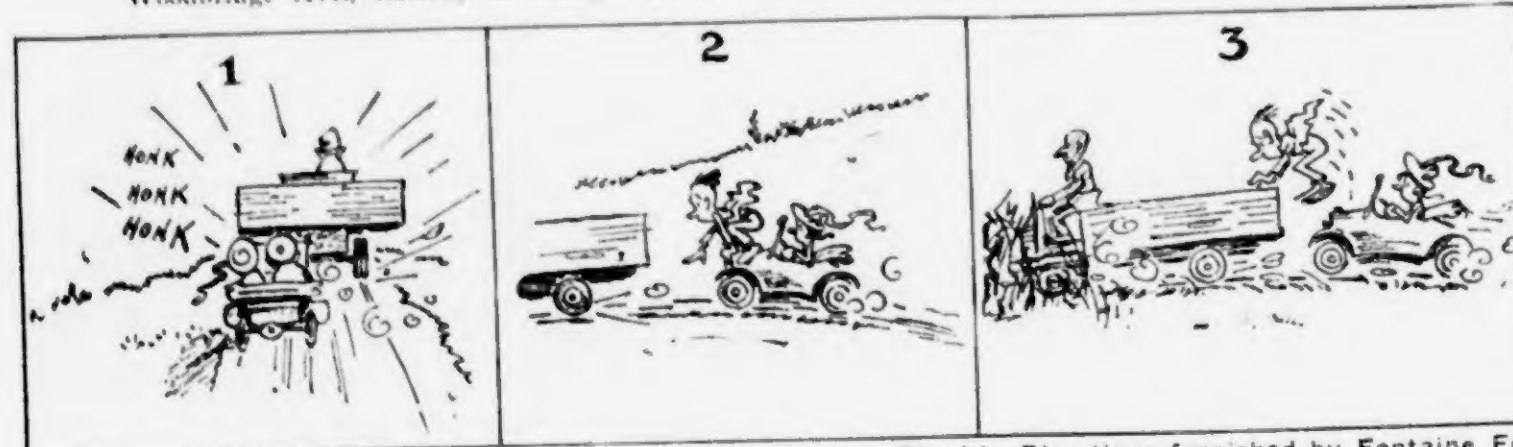
C. F. SEABROOK.

## Programme of Road Construction

If the work which the Highway Department is doing could be concentrated in one place, you road users could get some adequate idea of the magnitude of the job which a year's road work means.

Spread, as it is, over hundreds of square miles, most people never see more than a fraction of it. Study the table below, and learn at least of the new roads in your own section of the State.

Route No.	Sec. No.	From	To	Length Miles	Type	Constructed By
9A		Rahway-Elizabeth		1.473	Warranite Bit. on Concrete Base	State High. Dept.
10		Rahway-Elizabeth		1.492	Warranite Bit. on Concrete Base	State High. Dept.
11		Rahway-Elizabeth		1.611	Warranite Bit. on Concrete Base	State High. Dept.
1		Hightstown-Millstone River		1.44	Concrete	State High. Dept.
2		Burlington-Roebling		5.00	Concrete	State High. Dept.
2		Roebling-Bordentown		4.044	Concrete	State High. Dept.
3		Ancora-Ateo		2.571	Concrete	State High. Dept.
3		Ancora-Ateo		2.376	Concrete	State High. Dept.
4		Absecon-Smithville		5.690	Warranite Bit. on Concrete Base	Cnty Reimburs'm't
4		Mullica River Meadows		2.414	Gravel	State High. Dept.
4		Job's Creek Bridge approach			Earthfill	State High. Dept.
4	3A	South Amboy		0.582	Roadway Concrete; Trolley Granite Block	State High. Dept.
4	4	Keyport		0.782	Concrete	State High. Dept.
4	5	Red Bank-Eatontown		3.626	Concrete base; Street Asphalt	State High. Dept.
5	2	Draketown-Budd Lake		3.807	Concrete	State High. Dept.
5	2A	Hackettstown-Draketown		2.795	Gravel	Cnty Reimburs'm't
5	3	Ledgewood-Canal Culvert		0.927	Warranite Bit. on Concrete Base	Cnty Reimburs'm't
5	4	Madison-Chatham		2.90	Warranite Bit. on Concrete Base	State High. Dept.
6		Woodstown-Mullica Hill		7.246	Concrete	Cnty Reimburs'm't
6	5	Shirley-Oldman's Creek		6.812	Gravel	Cnty Reimburs'm't
6	7	Woodstown-Salem Road		3.987	Concrete	Cnty Reimburs'm't
6	4	Bridgeton-Shirley		7.54	Concrete	State High. Dept.
6	4A	Bridgeton-Shirley		0.82	Concrete	State High. Dept.
8	5	Sussex-Unionville		7.03	Concrete	State High. Dept.
9	A	City of Plainfield, Union Co.		1.010	Bituminous Construction; Concrete Base	Cnty Reimburs'm't
9	1-2	West Portal to Perryville		4.1824	Concrete	State High. Dept.
10	1A	Arcadian Way to Fort Lee Ferry		1.095	Bit. Con. and Granite Block on Concrete Base	State High. Dept.
10	1	Pine Brook to Parsippany		5.438	Bit. Con. and Granite Block on Concrete Base	State High. Dept.
12	2	Parsippany to Denville		1.19	Warrenit Bit.; Concrete Base	Cnty Reimburs'm't
12	3	Phillipsburg to New Village		4.696	Concrete	Cnty Reimburs'm't
12	4	New Village to Marlatt's corner		4.214	Concrete	Cnty Reimburs'm't
12	5	Marlatt's Corner-Port Colden		3.62	Concrete	Cnty Reimburs'm't
15		Second Street, Millville		0.765	Concrete	Cnty Reimburs'm't
<b>Institutional Roads</b>						
		New Lisbon-Four Mile Road		6.445	Gravel	State High. Dept.
		Woodbridge Ave., Rahway		0.663	Concrete	State High. Dept.



How to Pass a Truck!—Directions furnished by Fontaine Fox.

## Township Roads Under Construction or Completed, Year 1921

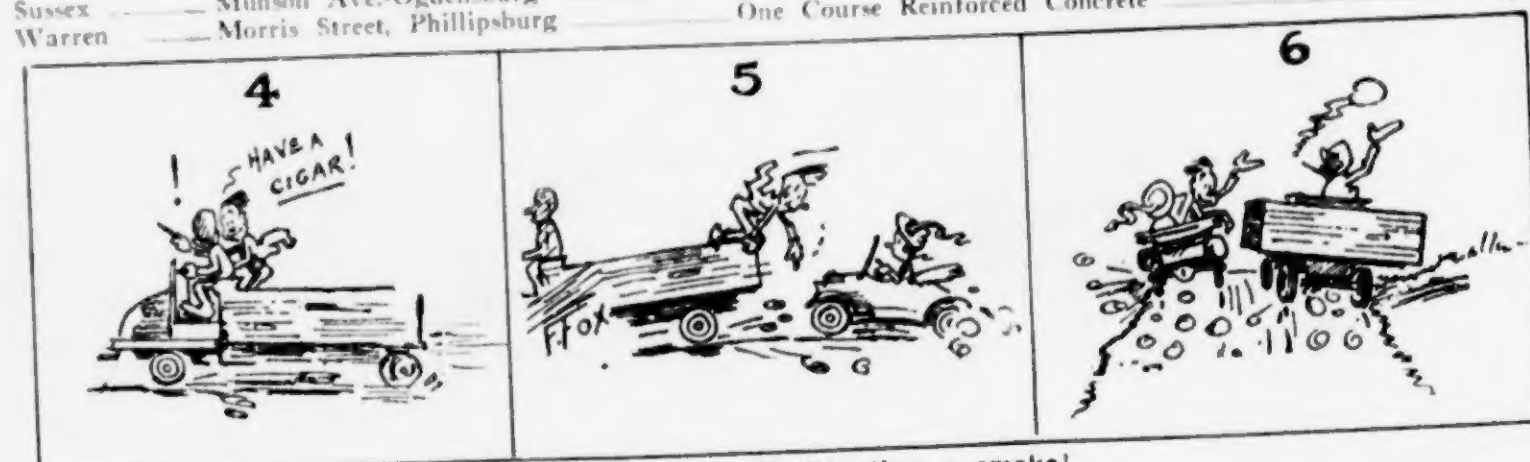
County	Name of Road	Type of Pavement	Kind of Job	Length
Atlantic	Weekstown Road	Gravel	Force account	5.00
Burlington	Browns Mills-Pointville Road	Gravel	Contract	1.50
Burlington	North Pemberton Road	Macadam	Contract	3.61
Burlington	Lower Bank Road	Gravel	Force account	3.00
Camden	Berlin-New Freedom	Gravel	Force account	.875
Camden	Braddock Ave.	Gravel	Force account	1.50
Cumberland	Mauricetown-Millville Road	Gravel	Force account	1.00
Cumberland	Centerton Road	Gravel	Force account	2.00
Cumberland	Deerfield-Seelye Road	Gravel	Force account	2.35
Cumberland	Husted Station, Route No. 6	Gravel	Force account	2.50
Cumberland	Parsonage Road and Deerfield Pike	Gravel	Force account	1.50
Cumberland	Newport Road (Sec. 2)	Gravel	Force account	1.00
Cumberland	Fairton-Herring Row School House	Gravel	Force account	1.50
Cumberland	Springtown-Salem Road	Gravel	Force account	3.75
Cumberland	Beebe Run Road	Gravel	Force account	4.00
Cumberland	Chestnut Ave.	Gravel	Force account	1.10
Cumberland	Roadtown-Jericho	Gravel	Force account	.75
Gloucester	Pedricktown-Center Square	Gravel	Contract	3.25
Hunterdon	Croton-Quakertown	Macadam	Contract	2.35
Hunterdon	Baptistown-Barbertown	Macadam	Force account	1.00
Middlesex	New Market Ave.	Water Bound Mac., Surface Treated	Contract	1.25
Monmouth	Clarksburg Paradise Cor. Road	Gravel	Force account	.25
Monmouth	Deal Beach Ave.	Gravel	Force account	1.0
Monmouth	Wickapecko Drive	Slag with Clay Binder	Force account	.50
Monmouth	Sixteenth Ave.	Gravel	Force account	1.00
Monmouth	Spring Lake Sta.	Gravel	Force account	.50
Monmouth	Wooleya Corner-New Bedford Hotel	Gravel	Contract	2.3
Morris	Ralston-Gladstone	Macadam	Force account	3.33
Morris	Naughton-Bartley	Macadam	Force account	2.54
Morris	Schooley's Mt. Pleasant Grove	Macadam	Force account	2.5
Salem	Auburn-Peons Grove	Gravel	Contract	.524
Somerset	Gladstone Pottersville Road (Sec. 2)	Macadam	Force account	1.5
Somerset	Bernardville-Loganville	Macadam	Force account	2.5
Sussex	Liberty Corner-Bernardville	Gravel	Contract	6.84
Warren	Montague-Port Jervis Road	Gravel	Force account	
Warren	Mt. Herman-Blairstown	Macadam	Contract	2.4
Warren	Hope-Great Meadows	Macadam	Force account	2.00
Warren	Hope-Mt. Herman	Macadam	Force account	
Warren	Warrington-Delaware	Macadam	Force account	

## State Aid Roads Under Construction or Completed Year 1921

	Type of Pavement	Length
Bergen	Bulls Ferry Road-Fairview Boro.	S. A. on Mac.; Trap Rock Block on Conc.; Reinf. Conc. .897
Bergen	Cherry Lane (Lincoln Ave.)	1 in. Sheet Asphalt and 6 in. Macadam Base 1.11
Burlington	Hamilton Corner-Roebling	Reinforced P. C. C. .6
Camden	Clements Bridge Road	One Course Concrete 1.17
Camden	King's Highway	Reinforced Concrete 1.00
Hudson	Passaic Avenue	5 in. Granite Blocks on 8 in. Plain Cement, Conc. Base .58
Hudson	Schuyler Avenue	1 in. Sheet Asphalt on 7 1/2 in. Crushed Stone 2.22
Middlesex	Blazing Star Road, Roosevelt Boro.	3 in. Grade W. on Concrete Foundation 0.74
Ocean	Jackson's Mills-Von Hiseville	B. C. Grade W. on Concrete Foundation 2.96
Passaic	Marshall Hill, Alcott & Union Valley	Compacted Gravel 1.978
Sussex	Fredon-Newton Road	Macadam with Bituminous Dressing on Broken Stone 3.39
Union	Chestnut Street, Roselle Boro.	Grading Only 1.21
Union		Portland Cement Concrete

## Motor Vehicle Aid Roads Under Construction or Completed Year 1921

		Length
Burlington	Burlington-Mt. Holly	2-1 1/2 in. Courses on S. A. 7.11
Camden	Market Street	Found. wid'n'd with Telford 2 course B. C. on 1 1/2 in. Mac 1.14
Camden	Wellwood Ave.	Compacted Gravel .5
Gloucester	Crown Point Road (Sec. 3)	2 1/2 in. Amiesite Compacted .74
Gloucester	Westville-Glassboro (Sec. 2)	Sheet Asphalt, 1 1/2 in. Bottom, 1 1/2 in. Top 2.43
Hudson	Belleville Turnpike	2 in. Bit. Concrete on 5 in. Broken Stone .2
Hunterdon	Main, York & Bridge Sts.	1 in. Sheet Asphalt on 6-8 in. Rebuilt Sub-Base 1.22
Middlesex	Jackson St.-South River	2 in. Bit. Concrete on 6 in. Concrete Base .442
Sussex	Munson Ave.-Ogdensburg	Bit. Macadam Penetration on Gravel Foundation 1.23
Warren	Morris Street, Phillipsburg	One Course Reinforced Concrete 1.17



With some truck drivers, however, a gun is more effective than a smoke!



# ALONG THE ROAD

## Plan a Run for Hallowe'en

Maybe "the old nest" is too far away for you to get there and "drop in" to surprise the folks on Hallowe'en.

And maybe it isn't!

Look up the location on the new road map you'll find on the back of this month's "Road Tips", and see if there isn't a good stretch of concrete, or other hard surfaced road, between you and there.

A little trip like that would do you and the whole family good.—An afternoon going away, an evening and morning with the folks, and back home by night. Or a real "week end", from Friday to Tuesday.

Don't you find it handy to have the "De-tours up-to-date" service, that you are getting in Road Tips, especially with the new road map on the back?

If so, why not put your friends wise to this service, which costs but a one-cent postal per year?

For that matter, you can send us the name of some of your motoring friends; and we'll gladly have THE HIGHWAYMAN stop and see 'em next month!

## Concrete Philosophy

by  
Corduroy Ike

Concrete is a hard thing to get your mind around. It's a hard thing to get your mind around. It's a hard thing to get your mind around.

Concrete is a hard thing to get your mind around. It's a hard thing to get your mind around. It's a hard thing to get your mind around.

Gosh, when you get that new road map and start working it over, it's a hard thing to get your mind around. It's a hard thing to get your mind around.

Then try to drive a car and you'll find out. It's a hard thing to get your mind around. It's a hard thing to get your mind around.

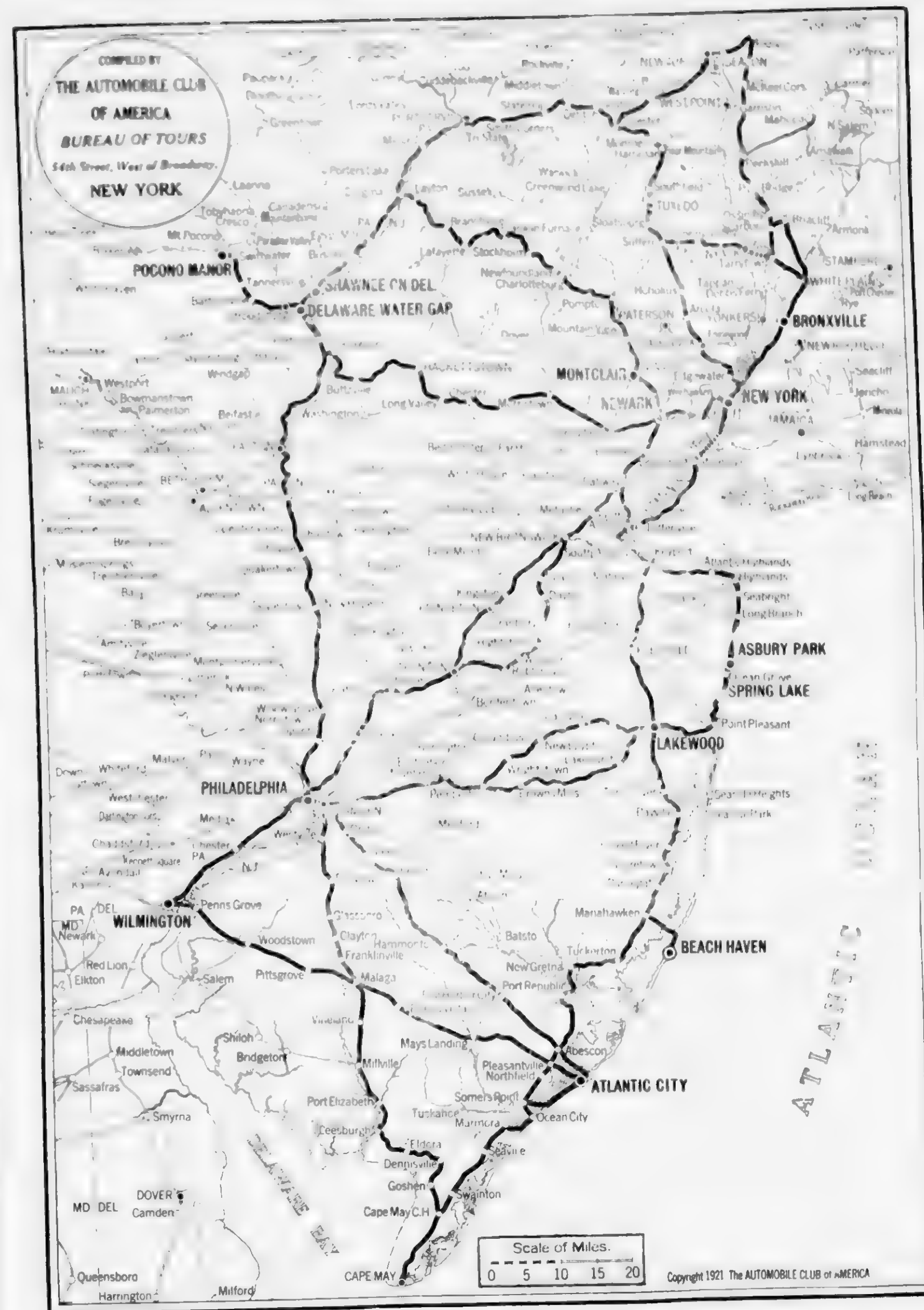
Usually it's the party who's to blame for the accident that yells loudest for damages.

Ford's got another idea for "increasing output". He's gonna leave the engine off the front; put handles on back, and sell 'em for perambulators.



Weary Walker—"Gee whiz! Dis is soitenly gonna raise 'ell wit me coast-to-coast record!"

"Seeing the Country!"  
These beautiful autumn days—and the way some drivers "enjoy" 'em!



Reproduced by courtesy of the Automobile Club of America.



# Road Tips



## MONTHLY BULLETIN OF DETOURS

Adopted by the New Jersey State Highway Commission  
Corrected to October 3, 1921

All detours posted with signs and blazed with "Arrows"

(Color signals to right will be used along all State roads as soon as possible.)

**ROUTE NO. 1—Rahway-Elizabeth: Union County**  
From Rahway Avenue or Route No. 1 in Rahway, over Milton Avenue to Irving Street, thence through Irving Street to Elizabeth Avenue, thence through Elizabeth Avenue to Grand Street, thence through Grand Street to Edgar Road, thence through Edgar Road to Washington Avenue Elizabeth, thence over Washington Avenue to South Street, then over South Street to Route No. 1

**ROUTE NO. 4—Red Bank-Eatontown: Monmouth County**  
Leaving Red Bank via Pickney Road, Oceanport Avenue to Little Silver, Little Silver to Oceanport to end of concrete pavement leading to West Long Branch.

**ROUTE NO. 4—Absecon-Smithville: Atlantic County.**  
Via Pitney road, Absecon to Port Republic.

**ROUTE NO. 5—Budd Lake to Hackettstown: Morris County**  
Not necessary to detour. New construction is completed along line of the old road. Present construction being along new right of way.

**ROUTE NO. 6—Mullica Hill-Bridgeton: Gloucester, Salem, Cumberland Counties**  
Leaving Mullica Hill via Commissioner's Road, through Lincoln and Daretown to Aldine; then east on Shirley-Elmer Road, a distance of about two miles; then south on Burlington Road to intersection of Route 6; following Route 6 to intersection on Finley Station Road, then turn on Finley Station Road to the intersection of Deerfield Turnpike (the present detour) then to Bridgeton. Effective September 15th.

**ROUTE NO. 6—Woodstown-Salem: Salem County**  
South bound traffic through Woodstown via Sharpstown to Pointers and Salem. North bound traffic Welchtown via Fenwick to Woodstown.

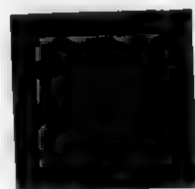
**ROUTE NO. 8—Sussex-Unionville: Sussex County**  
Not necessary to detour, as the present road will be kept open and maintained for traffic during construction.

**ROUTE NO. 9—Perryville to West Portal: Hunterdon County**  
Via Clinton, Glen Gardner, Hampton, Asbury, West Portal.

**ROUTE NO. 10—Arcadian Way to Fort Lee Ferry: Bergen County**  
Not necessary to detour as entire construction is over new right of way.

**ROUTE NO. 12—Denville-Parsippany-Pine Brook: Morris County**  
Denville, Tabor, Morris Plains, Morristown, Whippany, Hanover, Livingston, Essex Fells, Pine Brook.

**ROUTE NO. 12—Phillipsburg to Port Colden: Warren County**  
Phillipsburg, Bloomsbury, West Portal, Washington, Port Colden.



This color (blue) on posts or signs indicates that road is running North and South



Red shows that it lies East and West

While yellow tells you that it takes a diagonal course



### For You— "The Highwayman"

Do you use roads? Do you want to know where they are being built, and what detours to take, each month?

Then send, TODAY, to  
**The Highwayman**  
New Jersey State Highway Department  
Trenton, N. J.

Just ask to be put on The Highwayman's list. A postal will do.

### Turn Over!

On the Back You'll Find the Map.



## The Highwayman is Out For More and Better Roads in New Jersey

November, 1921  
Vol. I  
No. 4

### A Great Day!

I've attended some round-ups in my day.

But say!—for a down right darn good time, I don't recollect, right at the present writing, anything ranking ahead of that free-for-all Field Day and fun-fest that us\* Highwayman pulled off at Camp Edwards, Sea Girt, Saturday, October 15th.

The weather was perfect—just exactly what Bill Wildwood, of the Purchasing Department, had ordered. The bunch turned out early. They came from all over the state. Everybody in good spirits—feeling both fit and friendly. Not a loud word nor an argument did we hear the entire day.

Which, considering the enthusiasm there was for the contestants put up by the various departments, spoke mighty well for the personnel (whatever the Sam Hill that is!) of the Department.

### CO-OPERATIVE COMPETITION

You know, after all it's *enthusiasm* that counts. It's a funny thing, but you can take two bunches of men, give 'em the same equipment and the same material, and set 'em to work making a road. And one bunch will put down more road and better than the other.

Why?

There's no *physical* difference to explain it. The difference is something intangible—but just as real.

It's a difference in *spirit*.

The ideal kind of spirit for a bunch of men to have as Henglish 'Arry would put it, is 'arf-and-arf. That is, 50% co-operation; and 50% competition. Each man working *with* his teammates; and yet proud to be the best of the bunch if he can be.

\*The editor says I should have said "we", but, by Heck, this is *my* column and if he don't like my



### Let Us Introduce—

One of the Boys! An "un-named hero", but one of the several hundred tried and true Highwaymen who foregathered for the big outing at Sea Girt.

That's the kind of a feeling that was in the air at Sea Girt the other day.

That's the kind of a feeling we want in the whole Highway Department all the time.

It's good dope. It spurs a man on to the best there is in him—and, by that same token—to do the best he can for *himself*.

Every single (and married, too, for that matter!) member of the Highway Band should plan right now to be present at the next Big Meet to be held by the Highway Association. It's goin' to be a hum-dinger—or I'll swallow my sombrero.

### Watch Washington

Say, men—right now, down in the little old District of Columbia, D. C., there is goin' on the greatest thing for Highway folks—both the *makers* and the *users* of good roads—that ever happened in the history of the world!

If the Armament Limitation Programme (which might well be called the First-Signing - of - International - Sanity Society!) goes through, the indirect result will be "*good roads for all the world*."

Watch Washington,—the goins'-on there touch *you personally*. You can bet a bunch they do! They will affect every mother's son and daughter's father of you. And *vice versa*. They'll hit you in the heart and in the pocket book—both!

"Till we meet some more!"

*The Highwayman*

English, I can't help it. What's the difference between *us* and *we* anyhow?

## The Highwayman

Published Monthly By The  
State Highway Department, at Trenton, N. J.  
The HIGHWAYMAN will be sent free upon application  
to any citizen of New Jersey who is interested in  
"More and Better Roads For New Jersey!"

### THE HIGHWAYMAN

THOMAS J. WASSER, Editor in Chief

#### Assistant Editors

A. LEE GROVER, R. B. GAGE  
C. F. BEDWELL, EDWARD E. REED  
CHAS. FISHERG

#### Managing Editor

F. F. ROCKWELL

#### State Highway Commission

Governor EDWARD I. EDWARDS, Ex Officio

Hon. GEO. L. BURTON, Chairman - - - South River  
JOHN FERRIS - - - - - Jersey City  
GEORGE PADDOCK - - - - - Newark  
WALTER F. WHITTEMORE - - - - - Newton  
THOMAS E. COLLINS - - - - - Elizabeth  
ALBERT S. L. DOUGHTY - - - - - Mt. Holly  
CHAS. F. SHADROOK - - - - - Bridgeton

#### State Highway Association

President - - - - - A. W. MUIR  
1st Vice President - - - - - W. A. JOHNSON, Laboratory  
2nd Vice President - - - - - J. L. VOGEL, Bridge Division  
3rd Vice Pres. - - - - - WILLARD EMMONS, Equipment Div.  
4th Vice President - - - - - G. R. MOORE, Right of Way  
5th Vice President - - - - - WM. J. MCGOVERN, State Labor  
6th Vice President - - - - - H. D. ROBBINS, Construction  
Executive Secretary - - - - - EDWARD W. O'BRIEN

### "Public Service"

There are some men who are not proud of being "in the service of the public!"

Red tape, inefficiency, and "easy berths", have long been considered synonyms for government employment.

But there is no reason why they should be. In fact, there have been striking exceptions to the general rule. Such as the building of the Panama Canal, one of the biggest tasks ever undertaken in the world; and one of the most efficiently executed.

We believe that most State Highway Departments are now operated on a "strictly business" basis. Certainly it is our aim to make that true of our own State Organization.

And we want every man in this Department to feel that he can be proud not only of his work, but also of his co-workers, high and low.

We want him to feel that in "serving the public" he is doing the most worth-while work he could possibly be engaged in. Work that he can be proud to put his best effort into.

Let us make "public service," so far as all Highwaymen are concerned at least, a badge of honor in New Jersey!



Edward E. Reed  
Assistant State Highway Engineer

Edward E. Reed, like Tom Collins, started early to get his training to become a good Highwayman. Practically all his life has been spent in public work. After finishing the public schools, and attending the School of Industrial Arts of Trenton, he was employed in the City Engineer's office there. Later he worked with the County Engineer's office; and on July 1st, '09, he became Assistant Supervisor in the Department of Public Roads. This title was later changed to that of Division Engineer, and he was placed in charge of the construction and repair work in the Central New Jersey counties. Mr. Reed was appointed Assistant State Highway Engineer on April 1st, 1918.

### Famous Sayings of In-Famous Highwaymen

BILL WILDELODE:—I am sorry, but you know that has to be ordered through the State Purchasing Department.  
JOHN VOGEL:—Did you hear this one?  
GEO. MOORE:—This matter requires further and thorough consideration.  
C. F. BEDWELL:—Why the ——— etc., etc., etc.  
R. A. MEYER:—And I finally persuaded him to sign on the dotted line.  
GAGE (R. B.):—Well, sir! for G——'s sake!  
GRACE WILLIAMSON:—It has never come to the filing department.

### A Good Record

The newly organized State Highway Commission have held meetings weekly with one or two exceptions since July 1, 1920, and a quorum has been present at every meeting.

### Annual Report Ready in January

The annual report of the State Highway Department for the year 1921 will make its appearance to the public on or about January 1, 1922. The data for the report is now in the course of collection and preparation, and every effort is being made to have it in the hands of the public by the first of the year.

### Next Highway Association Convention Early in '22

Plans for the Second Annual Convention of the New Jersey State Highway Association are now under way. According to the plan as now mapped out, the convention should get under way early in 1922. The exact date, however, will appear in the December issue of the HIGHWAYMAN.



"Tom" Collins  
of Elizabeth, State Highway Commissioner

"Tom" Collins began training for his Highway Commission work at an early age.

As soon as he got through the public schools at Pottsville, Pa., where he was born, he spent three years at the United States Naval Academy. After that, he took a post-graduate course in Highway Engineering at Columbia College, New York.

Mr. Collins has served as Engineer with the New York City Highway Department, and with the Penna. Railroad. He has been City Engineer of Elizabeth, N. J., since 1914. He was on the Engineering staff in charge of the "Hudson tubes"; and has served on the State Board of Taxation and Valuations of Railroads and Canals.

With this splendid training, and his own natural ability, he has been a great asset to Governor Edwards' "action" Road Commission.

## NEW JERSEY STATE HIGHWAY DEPARTMENT

December 1st, 1920

### Executive

HON. EDWARD I. EDWARDS, Governor

The State Highway Commission

and

THOMAS I. WASSER, State Highway Engineer

### ADMINISTRATION

A. LEE GROVER, Secretary and Chief Clerk

M. L. HOWELL - - - Chief Auditor and Accountant  
CHAS. FISHERG - - - Assistant Chief Clerk  
MISS GRACE WILLIAMSON - - - Chief File Clerk  
R. W. WILDELODE - - - Purchase Clerk

### CONSTRUCTION DIVISION

C. F. BEDWELL, Construction Engineer

R. A. MEYER - - - Right of Way Engineer  
C. A. MEAD - - - Bridge Engineer  
C. A. BURN - - - Supervisor of State Labor  
ROY MULLINS - - - Northern Division Engineer  
H. D. ROBBINS - - - Central Division Engineer  
J. A. WILLIAMS - - - Southern Division Engineer

### MAINTENANCE, EQUIPMENT AND PROJECTS DIVISION

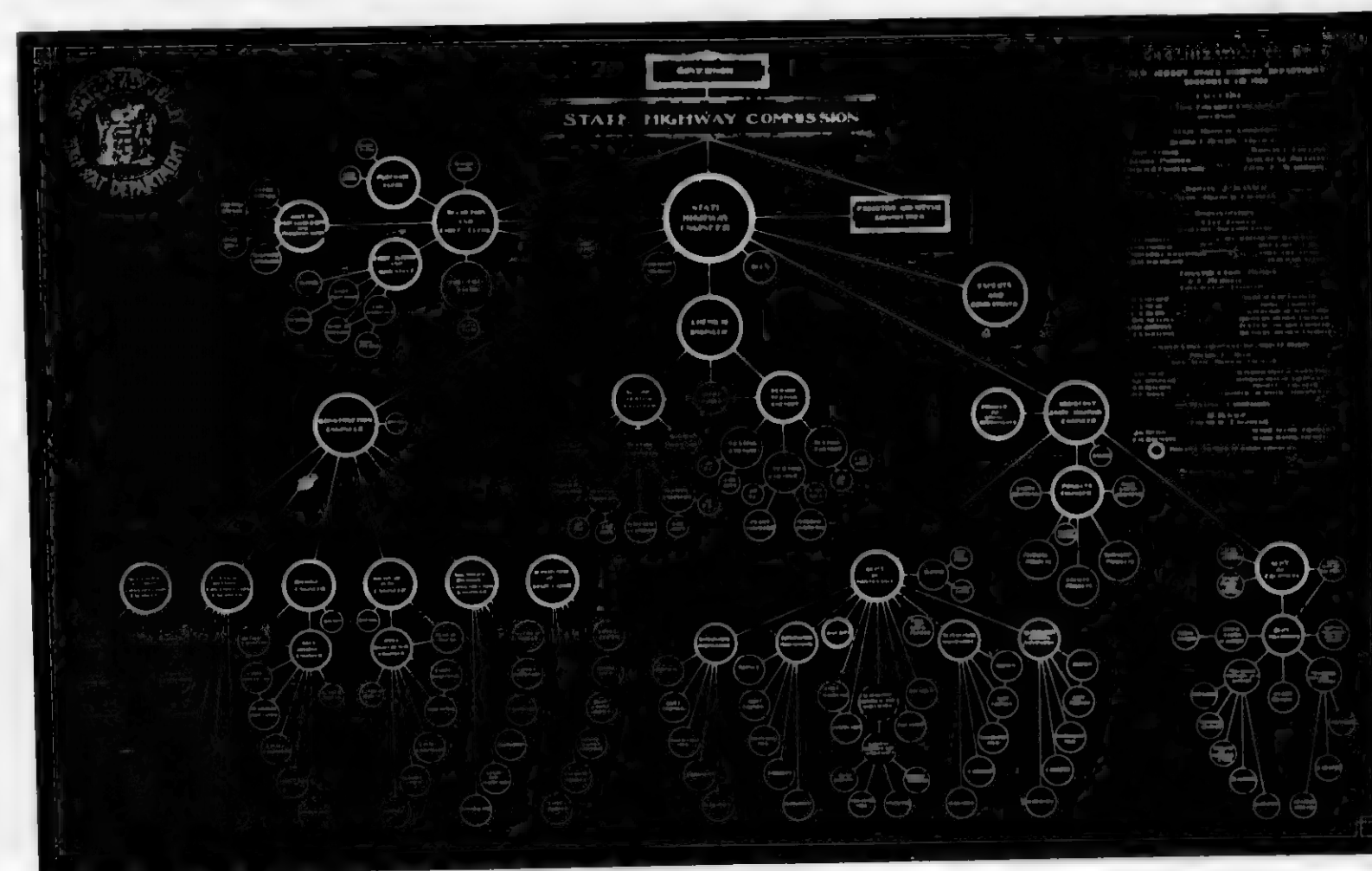
EDWARD E. REED, Assistant State Highway Engineer

A. W. MUIR - - - Superintendent of Maintenance  
N. C. APPELGATE - - - Superintendent of Equipment  
A. D. BULLOCK - - - Projects Engineer  
H. C. SHINN - - - Engineer of Special Assignments

### TESTING LABORATORY

R. B. GAGE, Chemical Engineer

J. G. BRAGG - - - Senior Testing Engineer  
F. H. BAUMANN - - - Senior Testing Chemist



This chart shows the way the State Highway Department—which spends, or cooperates in spending, some fifteen millions a year for you taxpayers—is organized. If the operating end of your business was spread over the entire State, you would find that it took a considerable amount of "organization" to keep track of every detail!



# The Highwayman of New Jersey

5



## Also, It Pays Better!

It takes 65 muscles of the face to make a frown and 13 to make a smile—why work overtime?

One of the boys on the Mine Hill job—as you can see, at half a glance, he is really interested in his work.

## Be the Best Whatever You Are

If you can't be a pine on the top of the hill  
Be a scrub in the valley—but be  
The best little scrub by the side of the rill;  
Be a bush if you can't be a tree.  
If you can't be a bush be a bit of the grass,  
Some highway some happier make.  
If you can't be a muskie then just be a bass—  
But the liveliest bass in the lake!  
If you can't all be captains, we've got to be crew,  
There's something for all of us here,  
There's big work to do and there's lesser to do,  
And the task we must do is the near.  
If you can't be a highway then just be a trail,  
If you can't be the sun be a star;  
It isn't by size that you win or you fail—  
Be the best of whatever you are!

—DOUGLAS MALLOCH.

## Bill Has Went An' Done It!

On the 27th of September, 1921, Bill Wharton took unto himself a wife. For many months past "Bill" has kept the office force guessing as to just when this event would become a reality, but by bribing marriage license clerks, train conductors and porters, we were all in absolute ignorance of what had taken place until "Bill" showed up one fine Monday morning after his vacation with "A Wife."

However, getting down to the serious side of things, we must say for Bill that he is one of the hardest working boys in the Department. When Bill does a thing he puts his whole heart into it and this combined with a winning personality and congenial manner, makes for the Assistant State Highway Engineer, Mr. Reed, one of the best secretaries who has ever collected reports for him. We might add that as yet we have not had the pleasure of meeting Bill's wife, but when we do we'll heartily say "Congratulations, Mrs. Bill."

In becoming a benedict Mr. Wharton is assured of the best wishes and good will of the entire staff of the Department.



Foreman Yanut's gang—we caught them just at the completion of the job.



Ferd Chapman, the leader of the fleet of ten Ford trucks on the Toms River job. These trucks have been used day in and day out for five months, and are a fine example of what care will do in the upkeep of equipment.

## Complimenting the Supervisor: or a Standard Gaged Kick at Our Shinn

Time—Construction Season, 1919.  
Place—Kingston, New Jersey.  
Enter—Chemical Engineer in a small Buick with extra big horn.  
Enter also—Supervisor of State Labor in a big Buick with not so much horn.  
Supervisor—"Fine Day?"  
C. E.—"Fair."  
Supervisor—"Come over new pavement?"  
C. E.—"Tried to."  
Supervisor—"Rides pretty good, doesn't it?"  
C. E.—"Well, we got here."  
Supervisor—"What do you think of the job?"  
C. E.—"Humph."  
Supervisor—"Now, no kidding, how does it compare with other jobs?"  
C. E.—"Well, we've got some pretty good jobs."  
Supervisor—"Consistency all right?"  
C. E.—"Well, I wouldn't say it's too dry."  
Supervisor—"How's the finish?"  
C. E.—"Well, pretty hard to say just yet."  
Supervisor—"Honestly, the job doesn't stack up so worse does it?"  
C. E.—"Tell you better five years from now."  
Supervisor—"Oh, she will wear all right."  
C. E.—"Glad you think so." Cackle—ha! ha!  
Supervisor—"Is it against your religious principles to say anything good about a job? I have pointed out features on this job that would move a wooden post to speak favorably. Come on R. B. loosen up, it's a pretty good job, isn't it?"  
C. E.—"Fair—Fair."

In the recent hearing of the Cape May Board of Freeholders, a hardy witness was asked: "What is your business?" His answer was, "My business is a preacher, but I farm to pay expenses."

Robert H. McCarter, of Public Service fame, was the counsel for the defendants, and in questioning a witness on the amount of wages received for work performed, asked, "and, did you charge the right amount of fare?"



And here you see them "bowing down"—they are a busy bunch.



One of the most important policies of the State Highway Department in road construction is the elimination of bad curves. Above is shown the heavy rock cut necessary to eliminate a dangerous curve on the Pine Brook-Parsippany job (Route No. 12). Mr. E. B. Holton, of Newark, is in charge of this.

## Honorable Mention, Bridge Division of the Maintenance Division

Mr. A. W. Muir,  
Supt. of Maintenance,  
Trenton, N. J.

Dear Sir:—Bridge Department Foreman Willmott is deserving of special mention on account of his uniform efficiency and loyalty. When we have a particularly difficult job to do he is the "man of the hour", and succeeds in doing when others say "can't be done." We need more men of this type.

Although younger at the game, Ralph Pearce is doing good work and can now tell a bridge when he sees one. He says he can take the squeak out of almost any bridge now.

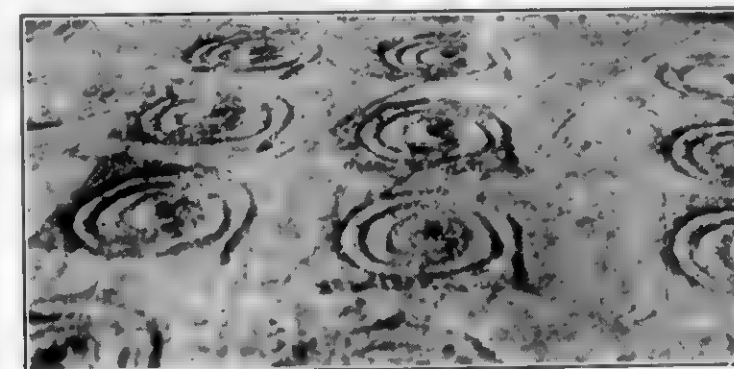
A. S. Quinn says we are giving him a dirty deal—he puts all the creosote on the bridge timbers—but claims to be an expert in removing the burns from the laborers' hands and legs—in fact, he will show you a remedy every time you see him which is his own manufacture and for which he has now 59 patents pending. What will he do with all his money?

John Brown has just been married and if Foreman Kelly could only conquer a fiver he says he might be able to tell how much paint his men are spreading.

E. S. CLASON,  
Supervisor of Bridges.

## New Method of Finishing Concrete Base for Bituminous Pavement

The Standard Bithulithic Company has developed a new device for securing a stronger bond between the base and the surface in bituminous pavement work. A square tamp on the face of which is fastened a spiral of 7/8 in. steel cable is used, with the result shown below. This device is being employed on the Pleasantville-Mays Landing Road, the DeCosta-Hammonton Road, and on Route No. 4 from Absecon to the Sea View Golf Club. Alexander Howard Nelson, Atlantic County Engineer, is in charge of the work.



This is NOT a close up of the icing on a layer cake, but a new finish on concrete base. (See above)

## Highway Contractors' Association Will Appear Here Every Month

Through the courtesy of Mr. Thomas J. Wasser, State Highway Engineer, the Highway Contractors' Association of New Jersey will publish a column in each issue of THE HIGHWAYMAN, dealing with facts interesting to all the members of this rapidly growing Association, and also to those who are interested in highway work in general. For this privilege and honor the Highway Contractors' Association desire to thank Mr. Wasser and the Highway Com-



Looks like he was digging fish worms—but in reality he is helping finish up the job at Mine Hill.

mission. Practically all the most reputable highway contractors in the State are now members of the Association or have signified their intention of becoming members.

In this issue we are publishing the aims and policies of this Association so that one can judge for himself the firm foundation on which it is built.

The purpose of the Association is to promote mutual confidence and better relations between its members and those by whom they are employed, to discourage and prevent as far as possible, unfair practices both by its members and by those with whom they do business, to encourage and promote honor and efficiency among its members, to support its members in all legitimate efforts to rectify unsatisfactory conditions, unfair stipulations and improper and onerous risks and liabilities, and to encourage sound business methods and the restoration of public confidence in the highway contractors so associated.

The special aims of the Association is to render membership therein a reasonable assurance to the public and public and private corporations or persons, of the integrity, responsibility and skill of its members, by requiring that they shall have established reputations on these three fundamental points, and to render continuance of membership therein contingent upon the retention by them of such qualifications, to provide means and methods by and through which members may avail themselves of the efforts of the Association to secure justice from those for whom they perform work, those from whom they purchase materials, transportation companies by whom said materials are delivered, and those under whose supervision they perform their work.

As our genial and energetic friend "Joe" Burke, Vice-President of this Association, so aptly said: "There is a vast difference between a contractor and one who is in the contracting business." We contend that all members of this Association are contractors.

In the next issue of THE HIGHWAYMAN the names of the members of the Association will be published.

A. V. BARRETT, Executive Secretary.



"Smiling" Ed. McCue, and one of his scoop conveyors.





Nick MacGowan trying a little "moral suasion" at the tug-of-war.

## A Letter from Chief Wasser to the Highway Association

STATE OF NEW JERSEY  
STATE HIGHWAY COMMISSION  
TRENTON

October 19, 1921.

Mr. Alex. W. Muir, Pres.,  
N. J. State Highway Asso.,  
Trenton, N. J.

Dear Sir:—

I cannot help but commend you, your officers, and members of the Association at this time on the successful outing that you held at Camp Edwards, Sea Girt, on October 15th.

I want to say to your members individually that the manner in which each and every man conducted himself was a credit to the Association and the Department.

The friendly rivalry in the contests of athletic sports brought out the best of feeling and will insure the heartiest co-operation in the duties to be performed as employees of the Department.

Very truly yours,  
T. J. WASSER,  
State Highway Engineer.

TJW/O'B.

## Laughry Leads in Spud Spurt

One of the impromptu events in which there was considerable interest, was a potato race between the young ladies of the Department. Miss Laughry, of the Construction Division, was the winner.



## Before

Beginning of the tug-of-war, for a purse of thirty dollars—between the State Highway Department and the Maintenance Department of the State Highway Association. It does not take more than one look to see that the audience was just as interested in the pull as the participants. The good looking guy at the left is the State Constabulary anchor man.



## Scenes from the Famous Waldron-Totoski Battle at Camp Edwards, Sea Girt.



Trooper Totoski and Jack Waldron start on their famous bout.



Jack is not as young as he used to be, but he is still a nice judge of delicate distances. The way he let the terrible Totoski slam him (ALMOST!) was certainly a shame to see! Our greatest regret, in regard to this bout, is that the camera could not do full justice to the expression on

Jack's face as he allowed his opponent to graze his nose or his ear. The umpire, Charles Roden, was kept pretty busy breaking them apart! Needless to say there were no fatalities to report, except that three unknown Highway men expired from a sudden rush of mirth to the head."

## October 15th—Nobody Knocked Out, but Three Spectators Died Laughing

Thank God every morning when you get up that you have something to do which must be done whether you like it or not. Being forced to work and forced to do your best will breed in you temperance, self-control, diligence, strength of will, content and a hundred virtues which the idle will never know.—KINGSLEY.



No, he is not "shoot my rap" as you might think, just "exhorting."

## Guess Column

Did you ever hear why a certain official of the Department took to signing his front name in full? Well here it is. This gentleman instead of using the free hand movement in writing his name and all other pen work, uses the Elgin movement, producing a very fine type of penmanship. No difficulties were encountered from his usual manner of signing his name until one day he received a reply to a letter which he had signed addressed to M—Miss—etc., etc.

One day Mr. Reed answered the telephone and was informed that Mr. Slim desired to talk to him—reverse charges. Meanwhile Mr. (Slim) was sweating in a telephone booth in Dover, New Jersey, trying to get some satisfaction out of the Central Office, while they were endeavoring to find out who Slim was. Shortly after this Mr. Slim decided that he would have to change his appearance, if that nickname was not to stick. He has recently gained considerable weight. Slim sounds very similar to his regular rear name.

Do you know a very busy and important official who thinks four paragraphs or two blocks ahead of what he is saying, and leaves you suspended about half-way from the end of his talks with the words (En'thing)?

## The Big Day at Sea Girt

Under the direction of Billy Miller, the athletic events scheduled for the Outing were carried off with complete success. The winners of the various events are as follows:

One Hundred Yard Dash—Van Auken (Construction Division) First; Fred Woodruff (Maintenance Division) Second; H. Francis (Maintenance Division) Third.

Tandem Race—Walter McCabe (Maintenance) First! Davidson (Laboratory) Second.

Fat Men's Race—Mickle (Laboratory) First; Knoes (State Labor) Second; Hickey (Maintenance) Third.

Potato Race—McCabe (Maintenance) First; Johnston (Administration) Second; Baker (Maintenance) Third.

Sack Race—Eldridge (Equipment) First; Corn (Laboratory) Second; Ondy (Maintenance) Third.

Base Ball Throw—Crater 281.2 (Maintenance) First; Fowler 276.3 (Construction) Second; Voorhees 259.2 (Construction) Third.

It was found necessary to eliminate certain other events scheduled due to lack of time.

If anybody at the big field day had a better time than the bunch above, then we miss our guess. The only draw-back, from their point of view, was that as they had about 300 partners waiting their turn to dance during the dinner hour, the poor girls didn't have a chance to eat. Beginning at the top of the ladder and coming down, they are,



Total points by Divisions: State Labor ..... 8  
Maintenance Division ..... 22 Laboratory ..... 6  
Construction Division ..... 9 Administration ..... 3

In addition to the above events in which the Division competed there was a Shoe Race for which there was a prize of \$10.00, which was won by George Hill of the Projects Division.

While Hill got away with this prize, we feel that he was playing in luck as one starter in the person of "Peggy" had his shoes thrown out of the barrel.

The tug of war was one of the interesting events of the day. The Maintenance team eliminated the Construction and the State Constabulary eliminated the Laboratory, and in the final play-off the State Constabulary pulled to draw with the Maintenance, and finally the State Constabulary anchor man pitted against the Maintenance anchor man to pull out the draw, won for the State Police and captured the prize of \$10.00.

Jack Waldron and Trooper Totoski of the State Police, put on a three round boxing exhibition which was greatly enjoyed and which resulted in very little damage being done to either men. This bout might be called a draw.

In a wrestling bout between Eldridge of the Equipment Division and Trooper Thompson of the State Police, Eldridge quickly demonstrated his superiority by making two straight throws.

"Peg" Barnett, Rose Fromkin, Lillian Courtney, Gertrude Watson and K. I. Laughry. The lady at the right with the Flora-dora hat is Miss M. M. Hennessey. The "supporting" cast constituting the other two appendages to the picture include "Charlie" Fishberg and "Lee" Grover.

## After

So evenly were the two teams matched that the umpire called it a draw, so the two anchor men made a personal event of it. After several minutes, which neither was inclined to give way in the slightest, the decision was finally awarded, by a hair, to the State Constabulary representative. The skinny chap at the right, is the anchor man for the Maintenance Department.



# The Highwayman of New Jersey

## Good Roads and Highway Transport

By GARLAND JOHNSON,  
Bridgeport, W. Va.

This morning the clank of chains and tramp of horses' hoofs called me to the window where the road scraper was smoothing the highway before the house. This afternoon a sudden rainstorm undid the work, leaving struggling motor cars plowing axle deep in clayey West Virginia mud.

Last March the upkeep of the dirt roads in the county cost \$22,000, besides which the muddy roads caused expensive damages and delays. This is the "mud tax," which everyone must pay directly or indirectly. Permanent highways will mean higher taxes, but they will be more than repaid by increased real-estate values and lowered transportation costs.

The invention of the railroad, during the early development of this country, made it possible for the nation to spread over vast territories in a few decades. A historian tells us that twelve thousand wagons passed between Pittsburgh, Philadelphia, and Baltimore in 1817. This would make a week's traffic over the Pennsylvania Railroad now. The railroad situation is a vital problem today, for when transportation breaks down, civilization cannot stand.

The country's needs have outgrown the railroads, and the motor truck on permanent highways seems to be the solution for our transportation problem.

The agricultural population of a country is the foundation of its prosperity. The influx of population to our cities is the most characteristic movement of today, and is largely caused by the isolation of farm life. Good roads and the family car give the farmer's family social advantages, and make possible a consolidated school and central church for the farm district.

The problem of the "high cost of living" is largely a distribution problem. Transportation takes toll from every consumer. With hard-surface roads a team or truck can pull ten times as great a load as on muddy roads, and the farmer can move his crops in accordance with the market rather than the condition of the roads, thus reducing storage costs and discouraging speculation.

Good roads lower living costs by keeping the produce on the farm and widening the area of productive cultivation.

Since the beginning of the World War vacation travel has been diverted to tours in our own country, resulting in a quickening of interest in road improvement. With the increase in automobile and extension of national highways tourist travel has increased rapidly, expending money at home rather than abroad, and promoting national unity and intelligent patriotism.

Ever since the Romans linked their empire together with roads that endure to the present day, military leaders have recognized the importance of good roads. Motor busses on the splendid highways of France brought up the reserves in time to save the Allies at Verdun. When the railroads of our country were burdened with war-time traffic, and embargoes were placed on nonessentials, the motor truck was extensively used to relieve the freight congestion. Money invested in good roads pays as high dividends in peace as in war. Truly, this is a form of preparedness which all can indorse!



GARLAND JOHNSON  
Winner of the "Road Essay" Contest conducted by U. S. Highway Transport Education Committee

## Miss Garland Johnson, 14, Wins the Firestone Prize for the Best Good Roads Essay. There Were Over 300,000 Contestants

Every year Harvey S. Firestone, of Akron, Ohio, offers a prize to the boy or girl of high school grade who writes the best essay on roads. The prize is a free scholarship for a complete college course, at any college the winner may select.

Garland Johnson, this year's winner, lives at Bridgeport, West Virginia.

"I am fourteen years old," writes Miss Johnson. "I was born in Newport News, and have lived for seven years in West Virginia and attended public school. When I wrote the essay I was a member of the freshman class of the Bridgeport High School. My father, Leake M. Johnson, is employed by the Clarksburg Daily Telegram. I live with my parents on a small farm."

Miss Katherine F. Butterfield, of Weiser, Ohio, sixteen years old, won the prize last year.

## Winning New Jersey Essay in the United States Highway and Highway Transport Education Contest

Our present civilization would be utterly impossible without the transportation facilities furnished by good roads and motor vehicles.

The most important activity of any commonwealth is agriculture, and those in touch with the farmer's problems know that his greatest difficulty is in marketing. This problem is fairly rapidly being solved by motor transportation. The motor truck also opens up new territory for both farming and industrial purposes. The radius of territory served by the individual physician has likewise been greatly increased by automobiles.

Motor trucks, however, cannot render maximum or even satisfactory service without good roads, so it follows that the fundamental factor in the transportation problem is adequate scientific road building.

In addition to raising land values and decreasing the cost of living, good roads resulted in increased educational advantages, with better living standards and higher morality.

Good roads means a decreased depreciation of motor trucks and according to M. O. Eldridge, Director of Roads, A. A. A., over \$119,000,000.00 per annum would be saved in tire and gasoline bills alone.

Over improved roads trailers may be used, thus increasing the tonnage possible of transport. The value of this was demonstrated in the coal famine during the winter of 1920-21, when thousands of tons of coal were transported from various mines by trucks and trailers.

An immediate advantage of widespread highway development would be to employ a great number of people now out of work.

J. CLARENCE DAMRON,  
93 Williams St., Orange, N. J.

## How to Use a Road Map

Complete Directions Paste This in Your Hat-band, or on the Wind-shield of Your Car!

Another writer person, H. J. Phillips, who is humorous though living in New York, is following a road map in the "Globe".

This map should be carried in a convenient place where it can be hauled forth at all crossroads and passed around to the auto occupants to study.

Not more than a half hour should be allowed each person for study purposes. This, assuming there are four persons in the party, cuts the time down to two hours of study at each crossroads.

Each person should then write his verdict on a small slip of paper and toss it into a hat. The driver should then take the hat and, without looking at the slips, dump them into the road and continue on trusting to Providence and familiar sign posts.

The courts are full of cases directly traceable to map-reading disputes between husbands and wives on the Sunday driver cruise.

When this is published a motorist should be able to cover a 50-mile trip without passing himself nine times during the journey.

Road maps are made in five colors: white, black, green, red and blue. The blue should denote the motorist.

The directions run like this:  
Medium black lines denote satchel roads, carrying Ford owners with grips full of sandwiches.  
Light black lines denote suitcase roads, i. e., bootlegging routes.  
Heavy red lines denote railroads.  
Medium red lines denote more railroads.  
Dotted red lines denote nothing so far as anybody has been able to determine.  
Dotted green lines are put in to make it harder.

But if you follow the directions carefully you can't go wrong. For instance:

To get to Dumdum Beach: Follow Dodo avenue to intersection with Blablab, Bunk and Mystic Maze streets; take sharp right, back up two blocks, turn car around twice and go with the wind two points abaft the beam until you reach the statue of General Grant in Hick Center.

It is best to drive around the statue. Every motorist who has tried driving through it this season has wrecked his car.

After passing Grant proceed west by east until you see a short traffic policeman with sunburned ears and a wad of tobacco in his left cheek; show him as much deference as you showed Grant; he's of lesser rank but he has more authority this summer.

## List of Bridges under Contract

Route	Bridge No.	Location	Length of Span	Type
1	Old Amboy	Between Perth Amboy and South Amboy		Replanting
4	Matawan Creek	Between Keyport and South Amboy		General Repairs
57		Latontown	8 ft.	Concrete Box Culvert
M		Parsippany	20 ft.	1 Beams, Concrete Slab
2-C		Hackettstown	29 ft.	1 Beams, Concrete Slab
2-D		Hackettstown-Drakestown	29 ft.	1 Beams, Concrete Slab
2-E		Hackettstown-Drakestown	30 ft.	1 Beams, Concrete Slab
6	140	Woodstown-Mullica Hill	7 ft.	Concrete Box Culvert
6	141	Woodstown-Mullica Hill	8 ft.	Concrete Box Culvert
6	145	Woodstown-Mullica Hill	9 ft.	Concrete Box Culvert
7	N	Manalapan-Millhurst	10 ft.	Concrete Box Culvert
7	10	Manalapan-Millhurst	6 ft. 8 in.	1 Beams, Concrete Slabs
8	Y	Near Unionville	30 ft.	Concrete Box Culvert
9	8	West Portal	10 ft.	Reinforced Concrete Pipe
10	Culvert	Little Ferry and Overpeck	4 ft.	Girder, Concrete Slab
12	1	Phillipsburg and Washington	50 ft.	1 Beams, Concrete Slab
12	2	Phillipsburg and Washington	20 ft.	1 Beams, Concrete Slab
12	3	Phillipsburg and Washington	15 ft. 8 in.	1 Beams, Concrete Slab
12	4	Phillipsburg and Washington	8 ft.	Concrete Box Culvert
12	5	Phillipsburg and Washington	30 ft.	1 Beams, Concrete Slab
12	6	Phillipsburg and Washington	16 ft.	1 Beams, Concrete Slab
12	7	Phillipsburg and Washington	10 ft.	Concrete Box Culvert
12	C	Phillipsburg and Washington	5 ft.	Concrete Box Culvert
12	D	Phillipsburg and Washington	8 ft.	Concrete Box Culvert
12	9	Phillipsburg and Washington	11 ft.	Concrete Box Culvert
12	11	Phillipsburg and Washington	11 ft.	1 Beams, Concrete Slab
12	12	Phillipsburg and Washington	30 ft.	Concrete Box Culvert
12	13	Phillipsburg and Washington	10 ft.	Concrete Box Culvert
12	14	Phillipsburg and Washington	40 ft.	1 Beams, Concrete Slab
12	15	Phillipsburg and Washington	9 ft. 3 in.	Concrete Box Culvert
12	74	Parsippany-Denville	35 ft.	1 Beams, Concrete Slab
12	84	Pine Brook-Caldwell	30 ft.	1 Beams, Concrete Slab
12	86	Parsippany-Pine Brook	26 ft.	1 Beams, Concrete Slab
12	88	Parsippany-Pine Brook	70 ft.	Girder, Concrete Slab
12	N	Parsippany-Pine Brook	15 ft.	1 Beams, Concrete Slab
12	Culvert	Parsippany-Pine Brook	4 ft. 6 in.	Concrete Box Culvert
12	Culvert	Parsippany-Pine Brook	4 ft.	Concrete Box Culvert
12	145	Little Falls over Canal	112 ft.	General Repairs
Mercer Co. 543-7		Carter Road over Shipetankie	40 ft.	Concrete Arch
Warren Co. 1, 2, 3, 4, 5, 6, 7		Hope-Blairtown Road	10 ft.-30 ft.	1 Beams, Concrete Slab



## Programme of Road Construction

Completed or Contracted for in the Year 1921

If the work which the Highway Department is doing could be concentrated in one place, it would be possible to provide adequate facilities for the study and development of the most important highway problems.

Spread over the entire State, the highway department personnel are scattered in many places, and it is not possible to have a central office where the work of the department can be coordinated and supervised.

Route No.	Sec. No.	From	To	Length Miles	Type	Constructed By
1	5	Hightstown	Millstone River	1.44	P. C. C.	State High. Dept.
1	7	Hamilton	Square	0.632	P. C. C.	State High. Dept.
1	9	Rahway	Elizabeth	1.473	Warrenite P. C. C. Base	State High. Dept.
1	10	Rahway	Elizabeth	1.494	Warrenite P. C. C. Base	State High. Dept.
1	11	Rahway	Elizabeth	1.643	Warrenite P. C. C. Base	State High. Dept.
1	1	Burlington	Roebling	5.000	P. C. C.	State High. Dept.
2	2	Roebling	Bordentown	4.044	P. C. C.	State High. Dept.
1	1	Ancora	Ateo	2.571	P. C. C.	State High. Dept.
1	2	Ancora	Ateo	3.376	P. C. C.	State High. Dept.
1	3	Absecon	Jagg Harbor (Comp'd)	9.870	P. C. C.	Cnty Reimburs'm't
1	7	Mullica River	Meadows (C'p'd)	2.413	Gravel	State High. Dept.
4		John's Creek	Bridge approach (Comp.)		Fairhill	State High. Dept.
4	1A	South Amboy		0.582	Roadway Concrete; Trolley Granite Block	State High. Dept.
4	4	Keyport		0.782	Concrete and Amesite	State High. Dept.
4	5	Red Bank	Fatontown	3.626	Sheet Asphalt, P. C. C. Base	State High. Dept.
1	8	Absecon	Smithville	5.600	Warrenite on P. C. C. Base	Cnty Reimburs'm't
1	2	Drakestown	Budd Lake	3.807	P. C. C.	State High. Dept.
1	2A	Hackettstown	Drakestown	2.795	Gravel	State High. Dept.
1	3	Ledgeswood	Canal Culvert	0.927	Warrenite on P. C. C. Base	Cnty Reimburs'm't
1	4	Madison	Chatham	2.90	Warrenite on P. C. C. Base	State High. Dept.
6		Woodstown	Mullica Hill	7.246	P. C. C.	State High. Dept.
6	4	Bridgeton	Shirley	7.54	P. C. C.	Cnty Reimburs'm't
6	4A	Bridgeton	Shirley	0.82	P. C. C.	State High. Dept.
6	5	Shirley	Oldmans Creek	6.812	Gravel	Cnty Reimburs'm't
6	6	Oldmans Creek	Mullica Hill	5.028	Gravel	State High. Dept.
6	7	Woodstown	Salem Road	3.987	P. C. C.	Cnty Reimburs'm't
8	3	White's Bridge	Bloomingsdale		P. C. C.	State High. Dept.
		(Completed)		1.162		
8	5	Sussex	Unionville	7.03	P. C. C.	State High. Dept.
9	1-2	West Portal	Perryville	4.1824	P. C. C.	State High. Dept.
9	A	City of Plainfield	Union Co.	1.010	Sheet Asphalt, P. C. C. Base	Cnty Reimburs'm't
9	4	Dunellen		1.063	P. C. C.	State High. Dept.
10	1A	Arcadian Way	to Fort Lee Ferry	1.095	Bituminous Macadam and Granite Block on P. C. C. base	State High. Dept.
		(Completed)				
12	1	Pine Brook	to Parsippany	5.438	Bit. Con. and Granite Block on P. C. C. Base	State High. Dept.
12	2	Parsippany	to Denville	3.39	Warrenite-P. C. C. Base	Cnty Reimburs'm't
12	3	Phillipsburg	to New Village	4.696	P. C. C.	Cnty Reimburs'm't
12	4	New Village	to Marlatt's corner	4.214	P. C. C.	Cnty Reimburs'm't
12	5	Marlatt's Corner	Port Colden	3.615	P. C. C.	Cnty Reimburs'm't
12	3	Ten Mile Run	to New Brunswick			Cnty Reimburs'm't
		(Completed)		3.841	P. C. C.	State High. Dept.
13	4	Princeton	Kingston (Completed)	1.764	P. C. C.	State High. Dept.
15	1A	Second Street	Millville	0.765	P. C. C.	Cnty Reimburs'm't
16	1	Bernardsville	Mine Brook	2.392	P. C. C.	Cnty Reimburs'm't
		(Completed)				
<b>Institutional Roads</b>						
		New Lisbon	Four Mile Road	6.445	Gravel	State High. Dept.
		Woodbridge Ave., Rahway		0.663	P. C. C.	State High. Dept.

### Motor Vehicle Aid Roads Under Construction or Completed Year 1921

County	Name of Road	Type of Pavement	Length
Bergen-Hudson	Belleville Turnpike	Granite Block on Concrete Base	0.490
Bergen	Wickoff Ave. & Main St.	Bit. Acadam & Reinforced Concrete	2.030
Burlington	Burlington-Mt. Holly	Sheet Asphalt on Macadam and Concrete	7.110
Burlington	Warren St. Beverly	Reinforced Concrete	0.515
Camden	Market Street	Bit. Concrete on Macadam Base	1.140
Camden	Wellwood Ave.	Gravel	0.610
Gloucester	Crown Point Road (Sec. 3)	Amiesite on Macadam Base	0.740
Gloucester	Westville-Glassboro (Sec. 2)	Sheet Asphalt	2.430
Hudson	Belleville Turnpike	Bit. Concrete on Macadam	0.200
Hunterdon	Lambertville Streets	Sheet Asphalt	1.220
Middlesex	Jackson St.-South River	Bit. Concrete on Concrete Base	0.442
Salem	Pennsville-Salem, 1st Sec.	Concrete	0.975
Sussex	Main St., Newton	Reinforced Concrete	0.140
Sussex	Munson Corner, Ogdensburg	Bituminous Macadam	1.230
Union	Central Ave., Westfield (Both Sections)	Reinforced Concrete	2.422
Warren	Morris Street, Phillipsburg	Reinforced Concrete	1.170

22.864

## State Aid Roads Under Construction or Completed Year 1921

State Aid Roads Under Construction or Completed Year 1922			
Bergen	Hunt Ferry Road	Reinforced Concrete	1,100
Bergen	Cherry Lane (Lincoln Ave.)	Sheet Asphalt on Macadam	0,588
Bergen	Williams Avenue (Sec. 1)	Reinforced Concrete	0,600
Harrington	Hamilton Corner Roebling	Reinforced Concrete	1,170
Chatham	Chatham Road	Concrete	1,000
Franklin	Franklin Avenue	Concrete	0,850
Franklin	Franklin Avenue	Concrete	0,850
Mercer	Carter Road	Bituminous Concrete on Concrete Base	0,741
Middlesex	Blazing Star Road	Bituminous Concrete on Concrete Base	2,040
Middlesex	West Ave., Swaren (Sec. 1 & 2)	Gravel	2,960
Chen	Jackson's Mills Van Hiseville	Gravel	1,978
Passaic	Marshall Hill, Alcott & Union Valley	Bituminous Macadam	1,364
Salem	Penns Grove-Pennsville (4th Sec.)	Concrete	3,190
Sussex	Fredon Newton Road	Grading and Drainage	1,210
Union	Chestnut Street, Roselle Born.	Concrete	1,300
Union	Martine & Park Avenues	Reinforced Concrete	1,300
			45,420

Township Roads Under Construction or Completed, Year 1921

County	Township	Name of Road	Type of Pavement	Length
Atlantic	Mullica	Elwood Weekstown	Gravel	5.00
Bergen	Franklin	Cedar Hill Avenue	Bit. Macadam	1.00
Bergen	Franklin	Kayne Avenue	Bit. Macadam	1.00
Burlington	Chesterfield	Crosswicks Hillside	Cinders	2.50
Burlington	Pemberton	Browns Mills-Pointville Road	Gravel	1.50
Burlington	Pemberton	North Pemberton Road	Macadam	3.40
Burlington	Washington	Lower Bank Road	Gravel	2.00
Camden	Berlin	Berlin-Jackson	Gravel	1.00
Camden	Berlin	Berlin-New Freedom	Gravel	0.80
Camden	Clementon	Kirkwood-Berlin	Gravel	0.75
Camden	Gloucester	Loyal Road	Gravel	2.00
Camden	Winslow	Braddock Ave.	Gravel	1.50
Cape May	Lower	Shunpike Road	Gravel	0.50
Cumberland	Commercial	Mauricetown-Millville Road	Gravel	1.00
Cumberland	Deerfield	Centerton Road	Gravel	0.50
Cumberland	Deerfield	Deerfield Seeley Road	Gravel	2.25
Cumberland	Deerfield	Husted Station, Route No. 6	Gravel	2.50
Cumberland	Deerfield	Parsonage Road and Deerfield Pike	Gravel	1.50
Cumberland	Downe	Newport Road (Sec. 2)	Gravel	1.00
Cumberland	Fairfield	Fairton-Herring Row School House	Gravel	1.50
Cumberland	Greenwich	Springtown-Salem Road	Gravel	3.75
Cumberland	Hopewell	Beebe Run Road	Gravel	4.00
Cumberland	Hopewell	Fithian's Corner-Roadstown	Gravel	1.00
Cumberland	Landis	Chestnut Ave.	Gravel	1.00
Cumberland	Stow Creek	Roadstown-Jericho	Gravel	1.50
Gloucester	East Greenwich	Paulsboro-Clarksboro	Gravel	0.75
Gloucester	Logan	Jedricktown-Centre Square	Gravel	1.00
Gloucester	Monroe	Williamstown-Glassboro	Gravel	1.00
Gloucester	Monroe	Williamstown-Sicklerville	Gravel	3.00
Hunterdon	Franklin	Croton-Quakertown	Macadam	2.00
Hunterdon	Kingwood	Baptistown-Barbertown	Macadam	4.00
Hunterdon	Raritan	Flemington-Clover Hill	Macadam	4.00
Hunterdon	West Amwell	Old Brunswick Turnpike	Macadam	1.00
Middlesex	Fiscataway	New Market Ave.	Gravel	2.00
Monmouth	Millstone	Clarksburg-Paradise Cor. Road	Gravel	0.50
Monmouth	Ocean	Deal Beach Ave.	Slag	1.00
Monmouth	Ocean	Wickapecko Drive	Gravel	0.50
Monmouth	Wall	Sixteenth Ave.	Gravel	1.00
Monmouth	Wall	Spring Lake Sta.-Osborne Corner	Gravel	0.50
Monmouth	Wall	Wooley Corner-New Bedford Hotel	Macadam	2.00
Morris	Mendham	Ralston-Gladstone	Macadam	3.00
Morris	Washington	Naughtright-Bartley	Macadam	2.00
Morris	Washington	Schooley's Mt. Pleasant Grove	Gravel	2.00
Salem	Oldmans	Auburn-Penns Grove	Macadam	0.50
Somerset	Bedminster	Gladstone Pottersville Road (Sec. 2)	Macadam	1.00
Somerset	Bernards	Gladstone-Loganville	Macadam	1.00
Somerset	Bernards	Bernardsville-Loganville	Gravel	2.00
Sussex	Andover	Liberty Corner-Bernardsville	Gravel	1.00
Sussex	Fredon	Springdale-Greendell	Gravel	0.50
Sussex	Montague	Andover-Greendell	Gravel	0.50
Sussex	Montague	Montague-Port Jervis Road	Gravel	0.50
Sussex	Sparta	Sparta-Woodport	Earth	0.50
Sussex	Sparta	Sparta-Woodport	Macadam	0.50
Warren	Blairstown	Mt. Herman-Blairstown	Macadam	0.50
Warren	Hope	Hope-Great Meadows	Macadam	0.50
Warren	Hope	Hope-Mt. Herman	Macadam	0.50
Warren	Knowlton	Warrington-Delaware	Gravel	0.50
Warren	Lopatcong	Delaware River Road	Macadam	0.50
Warren	Mansfield	Washington-Oxford Road to Karrville	Macadam	0.50

111.68

## ALONG THE ROAD

### Detours

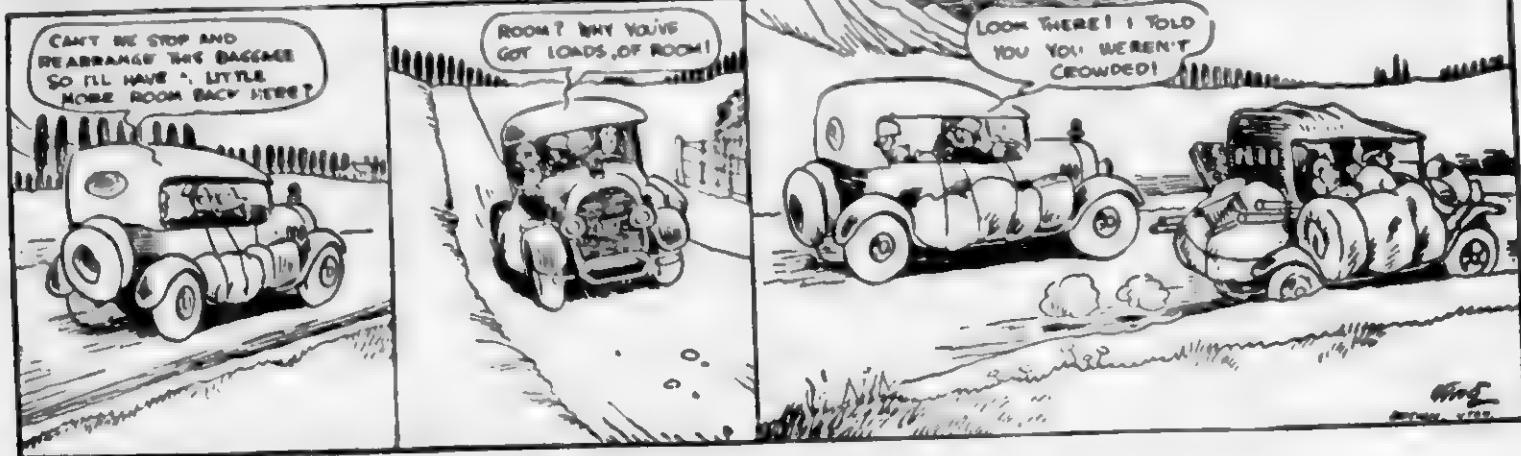
Did "You," fellow motorist, ever stop to think what *Detour* means? Just "Turning." Now, if we didn't have to turn, where would we go? We would miss some very beautiful scenery and some wonderful roads and the "How" how some of you'd ask, where would we come to a Detour sign?

All motorists believe in Signs. What would you do without the road signs—the ones that tell you where to go and how many miles?

The detour signs are just as important because it is a sign that means the road is being put in good condition for you. How many times have you gone over a road full of holes and badly in need of repair? How many times have you said it is a disgrace, something should be done, or I'll never go that way again?

And then in two or three weeks you start for a ride out in the country with wife and kiddies, you come to this same road. You come up to the sign and it reads "Road Closed—Detour—Follow the Arrow." You once more start and kick something like this: "Now what will we do, the road is closed, why don't they fix the roads in the winter, and not spoil our rides in the fine weather?" or "Just look, we have to follow that arrow." Where as if you did follow that arrow you would find in all probabilities go over a road that you never thought of through woods, over hill, across little streams. The next thing you would be saying, "Isn't this a fine road?" and "Just look at that pretty little brook. Wouldn't this be a fine place to come next Sunday, with the wife and kiddies, a large lunch basket?" and (ain't we got fun all by ourselves) you would pass the good news to your neighbor, and take all the week telling him or her what a fine place you found on such a road, but you would not stop and think how you came to find such a pretty place. You wouldn't give the detour sign and little arrows credit for it, now would you? You wouldn't stop and think how many days and nights it took for the men to pick out this little road and put it in good condition for you. You wouldn't stop and think how the man had to walk around with hammer and nails and bundles of arrows marking this detour for you. Oh! you wouldn't care, you would simply say, "I don't care how long it takes to fix that road now, we will always take this little road." Now, dear reader, the next time you come to a detour sign, just stop and think and follow the little arrow, it may be the turning point to some beautiful spot you have dreamed of all your life—C. M. R.

GASOLINE ALLEY—Not Even a Quorum



### Concrete Philosophy

BY CREDNEY LEE

Say, what's the use o' sticking 'round the house on Sunday morn', when you kin wheel the ol' bus out, and wond her where? Here, and wond beyond the city gates within no time at all, without a thought for railroad rates, or the conductor's van!

Off in the winding roads that lead through woods and shade, dears, you kin forget your craze for speed, an' the city's sounds and smells. You kin take an hour to catch your breath, an' with some friendly villum (not fixed with chemicals an' sudden death) smooth the kinks from your cerebellum.

Shake, if you must, your old grey head, an' say that this wonds foolish; stick, if you must, to noise and dust,

an' continue to be mulish. But if you're a fair minded cuss, and open to conviction, try on this treatment only once,—an' you'll find it isn't fiction!

### Why He Was Not Promoted

He watched the clock.  
He was always grumbling.  
He was always behindhand.  
He asked too many questions.  
His stock excuse was "I forgot."  
He wasn't ready for the next step.  
He did not put his heart in his work.  
He learned nothing from his blunders.  
He chose his friends among his inferiors.  
He ruined his ability by half doing things.  
He never dared act on his own judgment.  
He did not think it worth while to learn how.  
He imitated the habits of other men who could stand more than he could.

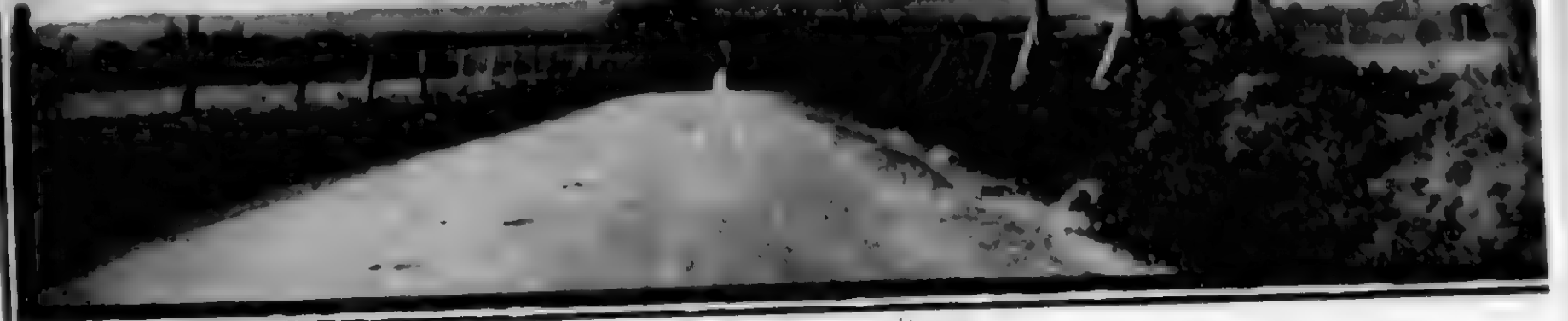
He did not learn that the best part of his salary was not in his envelope.—*Right Way Magazine*.

### A Reasonable Reason

"Why do you turn out for every road hog that comes along?" said the missus, rather crossly. "The right of way is our's, isn't it?"  
"Oh, undoubtedly!" answered he, calmly. "As for our turning out, the reason is plainly suggested in an epitaph which appeared in a newspaper recently:  
"Here lies the body of William Jay,  
Who died maintaining his right of way."

By King

# The Highwayman



Route No. 10—Maintenance Division  
between Rocky Hill and Haverhill

December, 1921  
Vol. 1  
No. 5

## The Highwayman is Out For More and Better Roads in New Jersey

### Your Job Is Getting to be Some Business!

It sure is enough to take your breath the way things develop in this little old land of ours sometimes.

It is but a few years ago that the first "self-propelled motor vehicles"—as they were then called—were looked upon by the crowds on the sidewalks as interesting, amusing, and useless curiosities.

Who would have predicted that within the same generation every fifth family in the U. S. would own one of these self-propelled motor vehicles; and a horse would be a curiosity?

And the automobile industry has grown to be one of the biggest in the country.

And look at the way the "movies" moved in, and up. One day, a scientific toy; the next, the fifth largest industry in the land!

And the next thing to keep your eye on is—ROAD BUILDING!

Here are a few figgers to set you thinking: There are 1,196 firms manufacturing road-building machinery.

7,000 contractors have over \$65,000,000 invested in road building equipment.

It takes 80,000 highway officials to attend to the country's road building business.

And yet, the business of road building is in short pants. Eighty-five per cent. of American roads are yet to be surfaced!

Boys, you can take this tip from me—Within a few years ROAD BUILDING is going to be one of the greatest industries in the country. There are going to be a lot of big opportunities in it. "A word to the wise" you know the rest!



### I Want to Say Merry Christmas! To You Guys Out on the Firing Line!

Say men, I wish it was possible for me to get out over all the roads of all the State and wish each

one of you a M. C. and a H. N. Y.

Of course, it isn't possible, no way.

I would have to travel as fast as old man Santa himself; and my boss—"Henry"—won't stand it; (by the way, Henry was pretty near frize up this morning, because I hadn't filled him with alcohol yet).

But, kiddin' aside, I want you boys that are right out on the gravel and macadam and concrete keepin' the holes filled, and the bridge-safe and the snow off—I want you to feel that the road users of this little ol' state appreciate what you-all are doing for them

N. J. is going to have the best highway system in this here land, bar none! And she's got one of the best Highway Departments, right now.

I'm wishing a right Merry Xmas to all Highwaymen everywhere—but most especially do I hope that Santa will put an extra joy wave in the sock of every last man in this N. J. Highway outfit.

So here's wishing—

A right hearty Holiday-time  
To the whole blooming family  
and

12 months of good luck to boot!

*The Highwayman*



# The Highwayman of New Jersey

## The Highwayman

Published Monthly By The

State Highway Department, New Jersey

The Highwayman will be sent free upon application to any citizen of New Jersey who is interested in "More and Better Roads for New Jersey."

### THE HIGHWAYMAN

THOMAS J. WASSER, Editor in Chief

Assistant Editors

A. LEE GROVER, R. B. GAGE  
C. F. BEDWELL, EDWARD L. REED  
CHAS. FISHERBERG

Managing Editor

E. L. ROCKWELL

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JOHN FERRIS, Jersey City  
GEORGE PADDOCK, Newark  
WALTER F. WHITEMORE, Newton  
THOMAS F. COLLINS, Elizabeth  
ALBERT S. L. DOUGLIV, Mt. Holly  
CLAS F. SEABROOK, Bridgeton

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5th Vice President, WM. J. MCGOVERN, State Labor  
6th Vice President, H. D. ROBBINS, Construction  
Executive Secretary, EDWARD W. O'BRIEN

## No Disarmament Here

There is one place in which there will be no disarmament—that is in our battle with the snow.

The time is rapidly passing when folks think of "laying up the car for the winter". With hard-surface roads to provide firm footing, and modern snow-removal equipment to keep the main highways clear, most car owners now figure on "running her through".

Keeping the trail clear, however, over 725 miles of road, is no easy task. Read the story on page 6 of this issue, and see how it is done.

...

## Keep in Touch with Road Work

We have endeavored to point out in this column before that road work is your work. You pay the bills for it; and you use the product—roads. Study the program of road construction shown on pages 10 to 14 of this issue.

The information concerns you just as much as does your own business or work. You must be familiar with it to judge intelligently whether or not you, as a taxpayer are getting your money's worth out of what you contribute to the State's expenses.

Look it over!



You fellows of the Department must have something good on the other fellows you are working with, that can be used in the "Famous Sayings" column; or a serious article expressing your ideas about highway work in general, or anything in particular. Send your dope in attention Mr. H. C. Shinn. Send us your photo also.



George Paddock, of Newark  
Another of Your Commissioners

Mr. Paddock was one of the organizers of the first automobile club in New Jersey and was the first president of the original automobile dealers association of New Jersey. He was also the first president of the national organization.

As a pioneer autoist, he holds the record for having driven an automobile longer than any other person in the state. He claims to have been the first automobile dealer in the state.

Mr. Paddock has long been active in the interests of good roads for the state of New Jersey. It was largely due to his efforts that the Eagan Bond Issue of 1916 was put through successfully. He was also one of the committee which succeeded in having the state legislature pass a bill for automobile reciprocity. He was appointed to the new State Highway Commission by Governor Edwards, June 20, 1920.

## To the Editor

Now My Dear Mr. T.

J Wasser, won't you please in your next issue of the Highwayman

S top

T alking

A bout

T he State

E ngineers, and the State chemist, and the State

H ighways, and say something good about the State

I nspectors? I think they should

G et an

H onorable Mention in your

W onderfully Interesting Magazine.

A s I am sure they too are trying to do their share in

Y our well planned road building program.

### A Construction Inspector's Motto

D o your work

E ach day, so that

P eople twenty years from now can

T alk well of it.

—George H. Pratley (Southern Const. Div.)

Good work, George! We feel that we can judge your work by your Motto. There is only one reason that mention of any section of men will be left out of the Highwayman, and that is because they imitate a clam and keep silent. If the fellow out in the field can think of something interesting to tell about their work, a good joke on the other fellow, or other information interesting to the Department or Public we would like to print it.

THOMAS J. WASSER.



## Christmas Greetings from the Big Chief

In expressing my hearty Christmas Greetings to the men and women of the Department, I want to extend my thanks for the support which I have received in the work before us and to express the wish that our mutual good feeling may continue and increase.

It is a well known fact, that men associated together in any enterprise may be obedient to instructions, insofar as written or verbal instructions go, but by neglecting to take an interest in matters coming before them, as they would if it was their own business or project, the real value of the work of individuals may be greatly lost.

While an executive at the head of an organization is usually well acquainted with the principles of organization, he may not realize that the spirit necessary to make anywhere near a hundred per cent success of the work possible is lacking in the organization unless it is pointed out to him by his associates and subordinates. The Executive Head may unconsciously be responsible for the condition which does not tend to bring out such advice or information from his subordinates. A conversation between myself and one of the men of the Department in a general way presented an opportunity for him to express the opinion in the spirit of constructive criticism that a condition prevailed in the Department, possibly due to a lack of understanding between myself and the men generally which does not tend to draw out the personal ideas of the men who are in charge of a given branch of the work. While it must be recognized by my assistants that in the final analysis the responsibility of the decision rests with the State Highway Engineer, it is my desire to consider the ideas of the men associated with me to the fullest possible extent, consistent with the time possible for me to allot to detailed discussion of the problems involved. If the individuals would prepare their ideas beforehand in such a way that the largest amount of information can be given in the shortest possible time and they would freely express their opinions without fear of unfavorable action on the part of the head of this Department, I am sure that a greater feeling of mutual respect and understanding would prevail between myself as State Highway Engineer and the men associated with me. It has been suggested to me that by my abrupt manner in conference or conversation, I shut off valuable ideas that would otherwise be given and I wish to state that if such has been the case it has been entirely unintentional on my part and must be charged to personal enthusiasm and a desire to accomplish the most possible in a short space of time.

Again assuring you of my sincere wish that you may all have a Merry Christmas and a Happy New Year, I remain,

Sincerely yours,

T. J. WASSER.

## NEW JERSEY STATE HIGHWAY DEPARTMENT

December 1st, 1920

### Executive

HON. EDWARD L. EDWARDS, Governor

The State Highway Commission

and

THOMAS J. WASSER, State Highway Engineer

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C. A. MEAD, Bridge Engineer  
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ROY MULLINS, Northern Division Engineer  
H. D. ROBBINS, Central Division Engineer  
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N. C. APPLEGATE, Superintendent of Equipment  
A. D. BELLOCK, Projects Engineer  
H. C. SHINN, Engineer of Special Assignments

### TESTING LABORATORY

R. B. GAGE, Chemical Engineer

J. G. BRAGG, Senior Testing Engineer  
F. H. BAUMANN, Senior Testing Chemist

## Famous Sayings of Infamous Highwaymen

ART BELLOCK (talking to himself): "Good night; they're going to put a temporary pavement five feet thick on the Kinkora fill. That's a dog gone good thing."

(Looking more closely at the extra work order, but not speaking quite so loudly or enthusiastically): "Maybe it's five tenths of a foot."



## N. J. Contractors' Association

On the next page you will find the "Highway Contractor's Column", which will appear regularly in the Highwayman.

We hoped to give in this issue, a complete list of the membership, but were forced to omit it because of lack of space. The membership list will be given in an early issue.



## Next Highway Association Meeting Early in Year

The Second Annual Conference of the New Jersey State Highway Association will be held beginning Wednesday, February 15th, 1922, and ending Saturday, February 18th. With the Association now well under way in regard to organization, there should be nothing to stop the conference from being a complete success. Several exhibits will be arranged and it is also planned to secure a number of prominent speakers, who will give interesting talks in regard to the different phases of road-building.

# The Highwayman of New Jersey

5

## The Highway Contractors Column

### Here They Are—Real Folks

The members of the Highway Contractors' Association of New Jersey are contractors of responsibility, and are as in their particular line of work. They are doing all in their power to put the highway business on a high plane, and to dispel that foolish opinion, which until the last few years was held by many tax payers, that a highway contractor is one that unfairly makes all the money he can from the State, Counties, and Municipalities. The Highway Contractors' Association of New Jersey is a body of reputable contractors banded together to build good roads in the State, and who in turn want to make a fair profit on their money invested, the same as all business men in other walks of life.

"Contractor" Joe Burke says: "And they are all contractors, too."

### A "Highwayman" Room in the Sussex Hospital

Contractors Chas. T. Kavanagh and Graham Van-Keuren on November 3th gave a block dance in Sussex on a few blocks of their partly constructed project, for the benefit of the Sussex Hospital. The proceeds of this dance, which amounted to \$350, was turned over to the Sussex Hospital to endow a room in that Institution for those who may be unfortunate enough not to be able to defray their own hospital expenses. This room is to be known as "The Highwayman."

The people in Sussex are exceedingly strong for Charlie and Graham.

Contractor Ralph Sangiovanni tendered a banquet on Nov. 16th to the Highway Commission, State Highway Engineer Thomas J. Wasser, heads of the various departments of the State Highway Department, several contractors and many guests, at the Hotel Penn, Trenton, New Jersey, in honor of completing Route 2, Section 2, running between Bordentown and Roeboling.

No doubt many of the contractors of this Association will emulate these gentlemen and let the public realize that contractors are real, human, social, business men, who try to spread happiness and good feeling throughout the State.

### A Little Of This and That

JOHN M. KELLEY: "There is rock south of Trenton."

CONTRACTOR JOE BURKE: "If I run second at any more lettings, I am going to get sore and show some of you fellows how to bid."

A. B. "CARUSO" WHELAN: "My orchestra is not here tonight."

RALPH SANGIOVANNI: "I-to of 1%. I might just as well have been 10% high."

FRED SCHNEIDER: "We thought we had that freight refund made out correctly."

THOMPSON & GLICKMAN: "We forgot to insert an item for \$1300."

"RECORD-BREAKER" BONHAM: "I guess that's pouring concrete."

JIM BARRETT: "I'll take a little (?) of this and that."

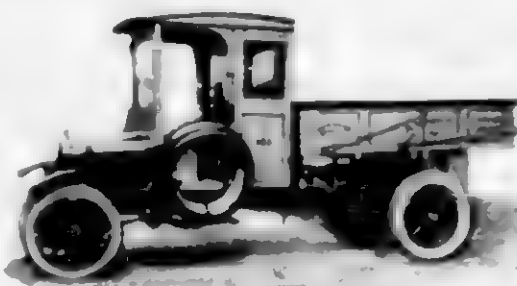
REES-TAYLOR INC.: "We'll show you how to build bridges."

HARRY SCOTT: "You can bet Cranbury is a fine place."

"JOHN MCCORMICK" McDERMITT: "Lou Whelan and I do not have to stay in the contracting business; we can join the Metropolitan Opera."

WILLIAM EISENBERG: "Oh, tempora, Oh mores, That should be Oh, Atco, Oh Ancora."

CARROLL EARL: "We certainly tried to make a good job from Smithville to Absecon, and I think we did it." We'll say so, Carroll.



Looks like new—but she isn't!  
It's all in the way Rankin takes care of her.

## How Does YOUR Truck Look?

Here is one that Johnny Rankin has run for over three months.

There surely is a big difference in the way different people look after things that are put in their charge—particularly when they do not own these things themselves. Neglect to take the best possible care of equipment is one of the big leaks in any Highway department. This particular leak might be cut down if every one concerned would make a conscientious effort in that direction, as may be gathered from the following letter:

Mr. T. J. Wasser:

There is attached hereto a Kodak print of State Highway Department Ford No. 133, which is assigned to the patrol unit under Greenwood Rankin, on Route No. 4, between Point Pleasant and Lakewood. The truck is driven by, and is the especial charge of John Rankin.

This truck is, I feel, a very fine example of what proper care will do in the way of keeping equipment in good condition. This picture was taken on October 1, after the truck had been in service for three and one-half months, and the truck is very plainly shown by the picture to be in a highly commendable condition.

Very truly yours,

ALEX. W. MUIR,  
Superintendent of Maintenance.

## Unskilled Labor

Unskilled labor is a term applied generally to men who do not come under a trade name, such as carpenters, masons, etc., but although the term is generally used, the meaning of the word unskilled does not apply to a great many cases of men employed in the repair, maintenance or construction of roads.

For instance, in the patching of a road which contains bituminous material, a man may go through the formula prescribed by his foreman of the department and make a patch which will roll out under traffic or creep and later fail, while another man will use his judgment and watch the results of the work that he is doing daily and like a good cook making a cake will learn to prepare the proper consistency of the material which will stick in the hole, ironing down smooth under traffic, making a permanent repair.

An individual case may seem insignificant or unimportant to the average person, but when you think of the thousands of holes that are being patched throughout the State, the failure or success of these patches when multiplied run into a matter of thousands of dollars.

The men on construction work listed on the payroll as unskilled of necessity must be skilled in the operations which they undertake in order to insure the best results for the traveling public and allow the contractor to break even or make a profit. Upon the attitude of this large class of men erroneously labeled unskilled depends the failure or success of construction and maintenance work, and any other similar enterprises.

One might go even further and generalize upon the whole "Unskilled" labor class and say that it constitutes a very important factor in the economic conditions of the country at large. Because by doing what may seem to be the small and unimportant thing well and trying to improve daily in the execution of these tasks great savings are affected.

It is not what you earn, but what you save, that makes you independent.

## What the Calyx Drill Tells About Joints

By GIAGE

Chemical Engineer

There is more diversified opinion regarding the proper method of making expansion joints than most any other phase of concrete pavement construction.

This difference of opinion seems to depend more upon local prejudice than upon past experience. In some localities, joints are spaced twenty-five feet, while in other localities joints are constructed only at the end of each day's work.

The materials used to make the joints also vary greatly. In some localities only pre-moulded joints are used, while in others the joints are poured. The position in which pre-moulded joint material is placed also varies. In some localities, it is set flush with the surface of the concrete while in others it is one-half inch above or below.

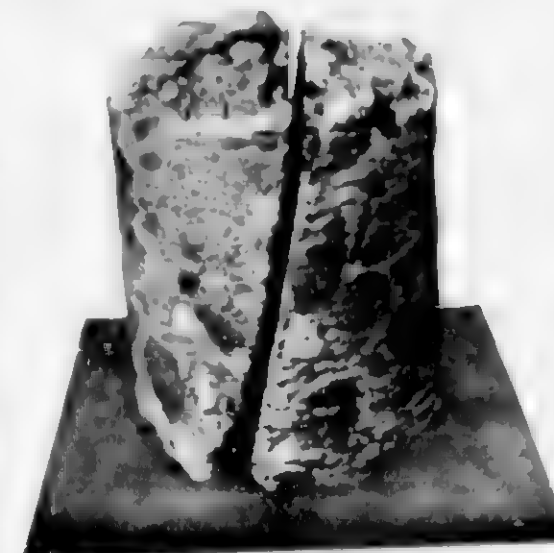
No doubt the composition of the concrete and quantity of reinforcement used should be considered in determining how and where expansion joints should be placed, also the stability of the subgrade.

Regardless, however, of the distance to which joints are placed or the kind of material used in making them, there is one point in joint construction about which there would seem to be no room for argument. The joint should be constructed perpendicular to the surface of the concrete.

If the joints are not so placed they will eventually slip or ride, with the results that one of the two surfaces will be higher than the other.

To prevent this, iron bars have been placed in the concrete perpendicular to the axis of the joint. But these bars are fairly costly and increase the cost of the pavement considerably when the distance between joints is not over fifty feet. They might safely be omitted if more care were exercised in the construction of the joints to insure that they are kept perpendicular to the surface of the pavement.

The Department recently cut some cores from a pavement in which the different slabs of concrete had no shifted at certain points that the surface of one slab was one-half inch below or above the adjacent slab. The cores were cut at the joints in order to determine the reason for this change in position of the concrete slabs. The pavement was constructed on about a two per cent. grade and it was found that the points had been placed in a vertical position instead of perpendicular to the surface of the concrete. The accompanying photograph shows the position of the joint very nicely for the core was cut practically perpendicular to the surface of the concrete and definitely illustrates the cause of the trouble.



The Calyx Core Drill continues to make good at locating road building faults. Above is a cross section of a concrete joint.

This is another illustration of the value of the Calyx core drills. The definite determination of some of the errors in construction discovered with its aid has certainly been very beneficial to the Department. The elimination of these errors or faults in construction will greatly improve the quality of future pavements constructed.

## Keep Fishin'

Hi Somers was the darndest cuss  
For 'catchin' fish—he sure was great,  
He never used to make a fuss  
About the kind of pole, or bait.  
Er weather, nether; he'd just say,  
"I got to catch a mess today."  
An' toward the creek you'd see him slide,

I achistlin' soft and walkin' wide.  
I says one day to Hi, says I,  
"How do you always ketch 'em Hiss?"  
He gave his butt another switch in,  
An' chucklin', says "I just keep fishin'."

Hi took to readin' law at night,  
An' pretty soon, the first he knowed,  
He had a lawsuit, won his fight,  
An' was a lawyer, I'll be blowed!  
He knowed more law than Squire McKnab!  
An', though he had no gift of gab  
To brag about, somehow he made  
A sober sort of talk that played  
The mischief with the other side.  
One day, when someone asked if Hi'd  
Explain how he got in condition,  
He laughed and said "I just kept fishin'."

Well Hi is Goe'nor Somers now;  
A big man 'round the state, you bet  
To me the same old Hi, somehow;  
The same old champion fisher yet,  
It wasn't so much the fishin' pole,  
It wasn't so much the fishin' hole,  
That won for Hi his big success,  
That just his fishin' on, I guess.  
A cheerful stidly, hopeful kind  
Of keepin' at it—don't you mind?  
And that is why I can't help wishin'  
That more of us would just keep fishin'.  
—Ray Clarke Rose.



More of the Field Day Events at Sea Girt at the Annual Outing



Above, Some of the White Collar Department Getting a Little Real Exercise. (Photo by Hall)



# The Highwayman of New Jersey

7

## Planning the Battle with Snow for This Winter

By Edward A. Reed  
ASSISTANT STATE HIGHWAY ENGINEER

The roads in the State Highway System, including some short pieces and extensions that have not yet been taken over by the Commission, comprise about 725 miles. Of this length it will be the purpose of the State Highway Commission to remove the snow from about 402 miles. This length is divided into 31 sections ranging in length from 9 to 17 miles. It is the purpose to have the sections as near 12 miles in length as practicable.

The unit on each section will consist of 3 motor trucks of 2 or 5-ton capacity, to which are attached snow plows. These are sent to different sections of the State with the plows attached so that they will be ready when the snow-fall commences. Some sections in the southern part of the State where it is expected that there will be comparatively little snow-fall, have only 2 trucks in each unit.

These sections are assigned to contractors who are doing work for the State Highway Department or who have work in the vicinity of the sections. These contractors are responsible for the removal of the snow on the sections under their jurisdiction. Through the co-operation of the U. S. Weather Bureau, which has an office in Trenton, we endeavor to give the contractors notice eight or ten hours in advance of the approach of any severe snow storm.

As soon as the contractor receives this Snow Call, he immediately gets his organization together and proceeds to the point where the trucks are stationed so that he will be ready to take the trucks and proceed with the removal of snow as soon as the snow is about 2 inches deep. Should the call prove to be a false alarm, the Department pays for the men's time during the period which was necessary for them to be at their station.

The results achieved last year through the co-operation of the contractors in charge of the various snow-removal sections were very gratifying indeed. We were able to keep the snow from the main roads without holding up traffic. The success of the work depends to a great extent on getting an early start, that is to start out before the snow gets very deep.

Each contractor keeps in constant communication with the Central Office in order to advise of the progress of the work in his section.

A great many of the employees of the Department have volunteered their services in connection with the removal of snow during the coming winter, and these men will be assigned to sections near their homes and will report to the contractor for any messenger service or emergency work that he may find for them.

A mechanic and helper is also assigned to each section so that he can look after the equipment of the State Highway Department and keep it in running condition during the storm.



A snow like this causes as much disruption to traffic as a railroad strike.

The main point impressed on each contractor is to keep the road open without interruption to traffic and should a severe storm arise in which communication would be cut off with the Central Office, the contractor would be left to his own resources and would have a good opportunity to demonstrate his ingenuity in keeping the road open no matter what his difficulties were. We expect that the snow will be removed promptly from every section assigned.

In addition to the above the forces of the Maintenance

## A Big Step Forward in Maintaining Gravel Roads

For many years the "dead" material along the edges of gravel roads has been a serious road problem.

Gravel for road building, as secured from the pit, is selected to contain the proper proportions of gravel stones and of "binding" material in the form of clay. There is also a varying percentage of fine sand contained in the gravel.

After this material has been put down in a road the action of rain and rubber take out of the road the clay binding material and tend to bring to the surface and leave the small gravel stones and sand. This material is scraped over the roads in the effort to fill the small holes that are formed under traffic, but after all the clay is

## of New Jersey

## N. J. Farmers and Motorists Urge State Bond Issue to Carry on Road Construction Work

Pennsylvania may be forced to yield her primacy in the Good Roads Movement to her sister commonwealth—New Jersey.

There is much significance in the appointment of a committee of five by the farmers organizations in the State of New Jersey to cooperate with a similar committee of motorists in urging a State bond issue of \$50,000,000 to carry on the work of highway construction. The farmers having experienced the benefits to be gained by good roads are now anxious that no time shall be lost in completing the system.

Bond issues for highway improvement have not been popular in New Jersey as far as concerns State improvement projects, and efforts in that direction have been repeatedly defeated in the Legislature. Announcement that all the anticipated revenue of the State Highway Department during 1922 will be required for the construction of a new bridge across the Raritan River, between the Ambros, however, has given new impetus to an attempt to change the Commonwealth's financial policy as regards the building of new hard surface roads, and rather than dragging the work over ten or twenty years, according to the inflow of current revenues, sentiment turns toward the bond issue.

The enterprise of Pennsylvania in pushing a comprehensive system of highways by means of a large bond issue possibly has spurred the Jersey men to abandon the slower method of financing improvements out of current revenues. But if the farmers across the Delaware and their motorist allies are successful in carrying their proposal, Pennsylvania having failed to take advantage of constitutional revision to provide funds for future development of her highways, may be forced to yield her primacy in the Good Roads movement to her sister Commonwealth.—Philadelphia Bulletin

## It Is Not Easy

To apologize.  
To begin over.  
To be unselfish.  
To take advice.  
To admit error.  
To face a sneer.  
To keep on trying.  
To keep out of the rut.  
To think and then act.  
To forgive and forget.  
To subdue an unruly temper.  
To maintain a high standard.  
To shoulder a deserved blame.  
To recognize the silver lining.  
But it always pays.—Ohio Educational Monthly.



But with modern snow-fighting equipment, like that above, it is possible to keep the roads open.

Department will see that the roads in the north and north-west sections of the State are kept open for traffic although the snow will not be entirely removed from these sections on account of the sleigh traffic. In the southern portion of the State and sections along the coast, the snow will be removed by Maintenance forces using tractors and scrapers, but on these sections it is not anticipated that it will be necessary to have the organization at work until after the storm has ceased unless it should appear to be of prolonged duration.

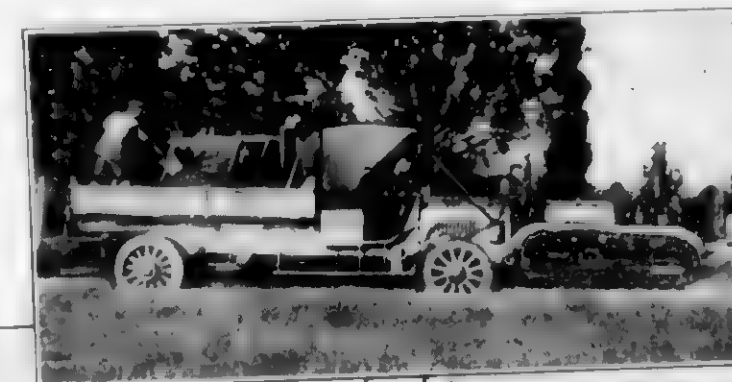
washed and worn out, the remaining sand and gravel become "dead" and useless. It is then scraped to the edge of the road; but here it obstructs the drainage of the road and narrows the travel road surface and becomes a serious danger to vehicles.

To remove this objectionable material by hand, however, has been so costly that it has not been attempted on a large scale.

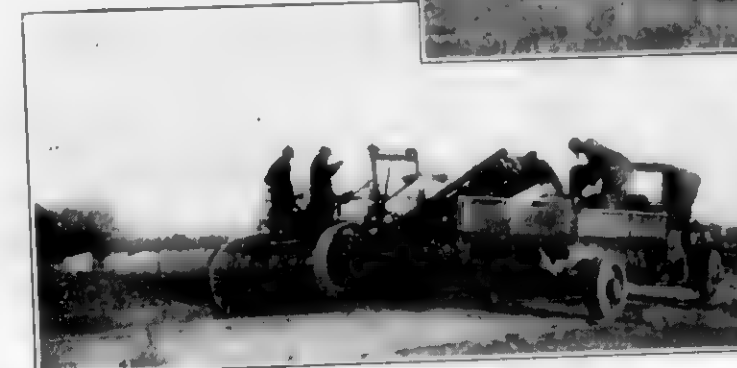
By the use of the special machinery shown in the accompanying photographs, the cost of handling this material has been reduced to a point where it has become a part of practical road maintenance.

By this method a large tractor pulls a grader and gravel elevator along the edge of the road. This elevator loads the surplus or "dead" gravel into a truck, which accompanies the grader. The whole unit moves along continuously.

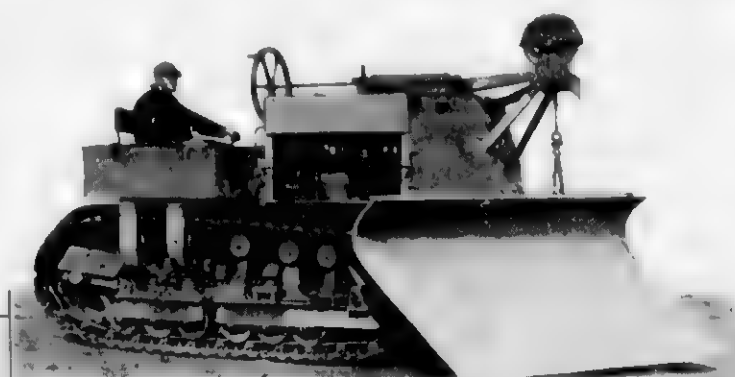
Side and rear views of equipment for removal of "dead" gravel from roadsides. The ten-ton tractor pulls the machine that picks up and elevates the gravel;



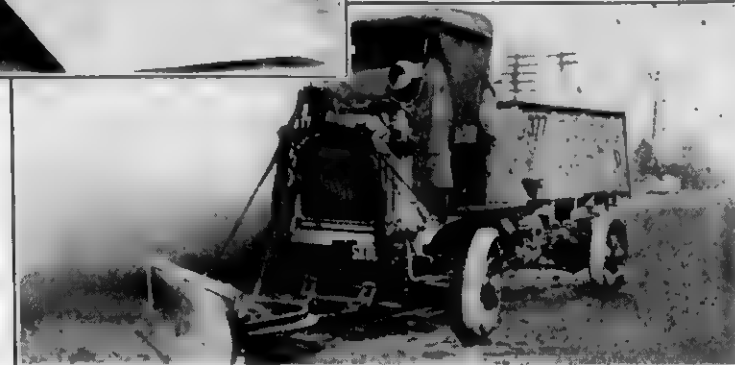
and the truck moves along side at the same speed. As soon as the truck is filled it pulls ahead and goes to the dump, another empty truck taking its place.



Down below are a few—11 out of over 100—of the Department's motor-truck snow plows, ready for this winter's war fare. They are Nash Four-wheel Drive with Good Roads Snow Plow Attachment



Here's a powerful combination—tank-type tractor and plow of enormous capacity. Down below, a close-up of one of the Nash Quads ready for business. It takes some snow to get ahead of it





# The Highwayman of New Jersey

## The January Good Roads Congress

The coming American Good Roads Congress, to be held at the Coliseum, Chicago, on January 17-20 next, will be of intense interest to every Highway man and road builder in the country.

This Congress is held under the auspices of the American Road Builders Association, the oldest and largest organization of its kind in the country.

Three of the eight sessions of the Congress will be devoted to a discussion of new methods used in the building of asphalt, concrete, brick and other modern pavements.

One session of the Congress will be given over to the consideration of problems of highway finance and administration.

Invitations to the Congress are being sent to nearly 30,000 federal, state, county and city officials, contractors, engineers and business men in the United States and Canada.

No less important will be the National Good Roads Show to be held at the Coliseum in conjunction with the Congress. This show will contain close to \$1,500,000 worth of labor saving road machinery appliances and materials and highway transport equipment.

### Cut It Out!

*The hardest work you ever do,  
Is worrying about it;  
What makes an hour resemble two  
Is worrying about it;  
The time goes mighty slow when  
You sit and sigh and sigh again  
And think of work ahead, and then—  
Keep worrying about it.  
Just buckle up and buckle in—  
Quit worrying about it.  
By work, not worry, you will win—  
Quit worrying about it.  
A task is easy once begun,  
It has its labor and its fun;  
So grab a hold and do it, son—  
Quit worrying about it!—Partners.*

### This Picture Shows

The following road building equipment as used on the Bridgeton-Shirley road.

From left to right—

Buffalo-Springfield steam roller, pulling a Lakewood sub-grader.

Two trains of batch-box cars (one near steam roller, other at mixer) pulled by Plymouth locomotives.

A Ransome 21 Paver; woven wire reinforcing and new center joint in position; Lakewood finisher running on Blaw road-forms; stretch of finished road (in immediate foreground); and (at right) a portable tent, mounted on rollers, in which the hand finishers worked.



J. A. WILLIAMS  
Division Engineer in charge of State Highway  
Construction in Southern New Jersey

### New Contracting Firm Takes Time Limit Seriously!

BY  
J. A. WILLIAMS

The concrete road on route 6—Shirley to Bridgeton—contains 8.3 miles.

The contract for this work was awarded to the Tri-State Construction Company of Bridgeton, New Jersey, and signed June 1. R. L. Bonham, formerly of the firm of Burke & Bonham (now Jos. F. Burke Company) is president of the Tri-State concern, which has been engaged in railroad work and the building of gravel roads in Cumberland County. The Route 6 job was their first State contract.

The work consisted of placing 98,254 square yards of Reinforced Concrete Pavement, 20 feet wide, 8 in. thick, with a center joint; proportioned, 1-2-3, with a mixing period of 1½ minutes; 5547 lineal feet of 5 ft. wide combined 8-inch curb and 6-inch thick gutter in 20 foot lengths; and the placing of 300 cubic yards of concrete pavement 6 inches thick at entrances and cross roads. A total of about 23,000 cubic yards of concrete, and 15,000 cubic yards of excavation, together with the usual drainage and guard rail features.

Both the center-joint and the type of reinforcing used were new features in road construction in this State.

This construction followed the line of Route 6 and replaces the gravel surface put down by Salem and Cumberland Counties about 1900, and has a graded width of



Ransome 21 Caterpillar Mixer at Work  
on Route 6

about 30 feet between ditches and guard rails. The work starting at the Bridgeton City Line goes through a rich farming country, through the settlement of Deerfield Street in Cumberland County, to Shirley in Salem County.

This work is most notable of any of the contracts that have been let by the State Highway Department, because of the fact that the contractor, either in making up his bid or after his contracts were executed, happened to notice that a date of completion was specified, and considering it seriously, proceeded to make his plans accordingly.

This action on the part of the contractors immediately proved their amateur standing, as judged by all past performances of highway construction. According to past experience, the contractor would either have overlooked the pages containing this unreasonable and impossible date, or, if they did notice it, would immediately compare the length of time allowed, with their previous work, and come to the conclusion that the copy of specifications which they had, was in error as to the year given for the completion date.

Or, had the date been verified, such comments as the following might have been expected:—

"Who ever heard tell of grading and building 8.3 miles of road in one year, anyhow?" and, "If I should finish it this season, I would have to lay off all my good men over the winter. You know, I keep all my good men over winter, so I can do good work"; also, "the railroads will fall down and not get me in materials enough. What's the good of another mixer if there are not materials?" etc., etc.

The contract was signed on June 1. Grading was started at Shirley Station 441, June 2nd, and at Station 192 on June 16th. The first road building equipment was on the

ground on June 19th. The first concrete laid at Shirley on July 6th.

The first day 27 feet was laid. Foreman never ran a concrete gang before and the crew was green. The first week's progress of 785 lineal feet; the second week's, 851 lineal feet; and at the end of the 4th week they were making an average progress of 300 lineal feet per day.

A two shift programme was then started on August 8th (another amateur trick). The first shift, going on at 4 A. M. worked until noon, and the second shift, going on at 12 M., worked until 8 P. M. The finishers worked through to midnight, finishing by artificial light.

This mixer complete to Station 185x21 on October 10, having laid 25,000 lineal feet of 20 ft. wide pavement in 75 working days. In the meantime, another mixer was started at Station 185x21 on July 19th and working one shift only, completed the pavement to Station 0x00 on August 30.

Equipment: 3 Ransome No. 21 Caterpillar Mixers. Two only used, one kept in reserve. Five 3 Ton Plymouth Locomotives. Two 6 Ton Plymouth Locomotives. Sixty-two Cars, two batch Boxes per car. Light Railway Equipment Company.

30,000 ft. 24 in. Gage track with 8 sets switches. One 5 ton Best Tractor. Used to stretch reinforcing, pull subgraders, and scarifiers.

One ten ton Holt used with Adams Scarifier Grader for shallow grading and to shift R. R. Cars at loading plant.

Two Marion Steam Shovels, No. 21, with Clamshell Bucket to unload sand and stone (1 part time) (1 full time).

One Keystone grader (part time). Two Ten Ton Steam Rollers. Tunnel Capacity, 2000 tons stone and 1000 tons sand. Cement House Capacity 2000 bbls. Cement.

Outside of listing the main equipment, I will not go into many details, except to say that it was working most of the time; and when it wasn't some one immediately found out the reason why. And then it did.

They even had a track gang on the narrow gage track, keeping it in shape. They ran their trains on schedule at 8 miles per hour. During a great part of the season over 20 carloads of materials were used a day and most of the time four days' supply was on hand. Only 5 days delay was caused by shortage of materials, two days for stone, and three days for reinforcing.

The maximum force employed by the contractor during this work consisted of one superintendent, nine foremen, and 167 men, distributed as follows: three foremen and 81 men on the mixers operating them, setting forms, fine grading, etc.; one foreman, 16 men at the unloading plant; one foreman, 22 men maintaining and moving track and switches; one master mechanic, 16 men operating hauling equipment; three foremen and 32 men and 6 teams on the grading.

There was at all times a survey party of three men on the work, together with five inspectors; all in charge of a construction inspector. The inspection force was divided as follows: two men at the plant, one for each shift, three men on the mixers, one on the mixer working one shift and two on the two shift mixer. The construction inspector had general supervision of all work, stopping at each operation several times a day.

The force of inspectors kept accurate account of all materials going into this work and we find that the materials actually used in the concrete work check within .014% of the theoretical amount required.



One of the Two Complete Concrete-Road-Building Units Used by the Tri-State Construction Co. on the Bridgeton-Shirley (Route 6) Job



# The Highwayman of New Jersey

## CONDENSED MAINTENANCE REPORT JAN. 1, 1921, TO NOV. 15, 1921

Route	Concrete Maintained Miles	Macadam Maintained Miles	Gravel Maintained Miles	Bit. Conc. Maintained Miles	Bit. Mac. Maintained Miles	Brick Dux Maintained Miles	Total Maintained Miles	Shoulders R. O. W. Maintained Miles	Macadam Resurfaced Miles	Gravel Resurfaced Miles	Penetration Shoulders Conc. Miles	Detours Maintained Miles
1	11.361			12.161		1.420	24.942	15.400			1.810	8.150
2		15.419		4.600			20.019		3.850			
3	14.056	0.100		13.000			27.156					
4	8.621	6.416	63.734	9.367	1.805	2.820	92.763	1.000		13.357		17.600
5	1.136	20.457	4.810	21.879		0.720	49.002	4.370	2.220	1.000		
6	0.074	5.060	13.817	3.102	2.000	0.523	24.576		3.660	1.000		38.000
7		15.960	12.700				28.660		7.810	3.300		
8	0.050	19.209		10.772	6.040		36.071		5.260			
9	0.189	30.886		11.986	1.494	1.420	44.975		6.924			3.100
10	0.652	1.775		3.830			6.257					
11												
12	0.600	5.426		2.190	8.520		16.736		2.200			1.000
13									0.250			
14	8.191	4.250		5.090	0.300	1.400	19.231		3.750			
15	5.780		35.500				41.280					
16		29.305	44.300	4.638	0.720	0.230	79.193		16.360	5.630		0.700
50-710	154.263	174.861	102.615	20.879	8.553		511.881	21.770	48.604	28.037	1.810	68.550

\* Macadam Resurfaced and Bituminous Concrete surface laid.

Briefly summarizing the above table, the outstanding features of the same are as follows:

Total Mileage Maintained	511.881
(Of the above total mileage, 329,124 miles, or 64%, were waterbound macadam and gravel, low type pavements lacking in the durability required by modern trunk line traffic.)	
Miles of Macadam Resurfaced	48.604
Miles of Gravel Resurfaced	28.037
Miles of Detour Maintained	68.550
Tons of Broken Stone, Pea Gravel, and Crushed Slag used	100,738.70
Cubic Yards of Gravel used	78,884.00
Gallons of Bitumen used for Surface Treatment of Water-Bound Macadam	362,185.00
Gallons of Bitumen used for Cold-Patching Water-Bound Macadam	134,009.00
Gallons of Lignin Binder used for Treatment of Gravel Roads	792,112.00
Bridges Painted	66
Bridges Redecked	16
(Of the above bridges painted and redecked, one was 1,095 feet in length, another 878 feet, while the remainder were of varying lengths down to 10 feet.)	

### STATE AID APPORTIONMENTS—1921-1922

Before giving the State Aid apportionments for the years 1921 and 1922, it seems desirable that a few words in explanation of this source of revenue might also be given in order that the public will have a better understanding of the funds used in highway construction.

Chapter 395, Public Laws of 1912, amendments thereto and supplements thereof provides for the annual appropriation by the State Legislature of \$500,000.00 to be apportioned among the Counties applying for same under State Aid. The law provides that the State may share to the extent of 40% in the cost of construction plus engineering, inspection, and contingencies. This money is used for new construction work, and is apportioned among the Counties of the State upon their request for same. It will be seen that the \$500,000.00 apportionment for such work while of some assistance to the Counties, is totally inadequate when it is stated that this amount fell short over three (3) times this year the amount of money re-

Continued on Page 11, Column 2

### Motor Vehicle Aid Allotments

In making public the disposition of the 1921 Motor Vehicle allotments, it seems desirable to explain the meaning of the Motor Vehicle Aid Fund, the purpose to which it is devoted, and some of the results gained through this source of revenue.

In 1906 the Legislature provided for the registration of all Motor Vehicles and the collection of license fees for vehicles and drivers, and it is the money collected through this agency that is used for maintenance and betterment work, extraordinary repairs, and reconstruction work on roads in the State Highway system and Counties of the State.

An item of \$210,000.00 is taken from the Motor Vehicle receipts and set up to the credit of Township road improvements, authorized under Chapter 217, Public Laws of 1916, and amended under Chapter 53, Public Laws of 1920. This Township Aid money is used for the improvement of unimproved Township roads.

The Counties are required to match the amount allotted by the State.

Heretofore allotments to the Counties were based on estimates of cost submitted by the County Boards of Freeholders, which estimates were arrived at after a study had been made of the mileage and repairs to be taken care of.

This year the sum of \$2,000,000.00 was apportioned among the various Counties of the State for maintenance, betterment, extraordinary repairs, and reconstruction work on County roads. This year the money was apportioned under a method wherein each County's population, road mileage, and area were compared with the total road mileage, population and area of the State. These comparisons arranged in a percent. of the total value of the State at large and an average of these percentages being taken would give the average percent. for each County, which average percent. multiplied by the total amount for distribution would give the County's apportionment. The road mileage was based on the report submitted by each County July 1, 1920, and the area and population of each County was taken from the 1921 Legislative Manual.

The above method is used by the Federal Government in apportioning Federal Aid allotments.

The following is a list of the allotments to the Counties for the year 1921:

## CONDENSED MAINTENANCE REPORT JAN. 1, 1921, TO NOV. 15, 1921

Broken Stone Used, Tons	Bitumen Surface Treatment Gallons	Bitumen Cold Patch, Gallons	Bitumen Penetration Gallons	Lignin Binder Applied, Gallons	Gravel Used Cu. Yd.	Pea Gravel Used, Tons	Slag Used Tons	Bit. Conc. Used, Tons	Bridges Painted	Bridges Redecked	Wood Preservative Gallons	Minor Repairs, Addition, Redeking
2,817.70	3,905.00	25,050	10,108		310.00	51.70	1,056.90	695.70	6			
4,214.40	38,053.00	7,000			1,578.00			304.90	4	1	400	
735.40		4,500			32,306.00			487.50				
462.70		3,597		350,441				503.70	4	3	1697	6
5,045.10	45,226.00	11,871		11,000			1,715.90	676.80	11	1		
10,196.30	2,500,000	5,250		11,765	3,660.00		115.40			2	2550	
10,621.40	23,320.00	4,947		58,495	7,679.00		685.90		7	1		
8,294.20	28,103.00	10,350			817.00		775.60		6	1		
13,279.00	108,281.00	17,100					1,724.70					
192.30		3,897										
5,128.30	36,523.00	16,700					1,970.90					
1,361.70	15,057.00	1,200		155,869	14,499.00	754.20			3	1		
	600			184,542	18,015.00				6	2		3
									2	1		1
24,666.40	61,217.00	21,747										
87,014.90	362,185.00	134,009	10,108	792,112	78,884.00	2,099.70	11,624.10	3,383.40	66	16	5197	15

Continued from Page 10, Column 1

quested by the Counties under the State Aid Act. In other words, the total amount of State Aid asked for was \$1,700,000.00. Effort is made, however, to allot to the Counties who make requests for State Aid a sum which will be of assistance, and at the same time not bar some other County from receiving benefits under this act. The Department attempts to make a small amount of money help in the construction of a good many roads.

State Aid allotments for the years 1921-1922 are as follows:

County	Distribution to come within Funds Available
Atlantic	\$20,000.00
Bergen	35,000.00
Burlington	
Camden	29,000.00
Cape May	24,000.00
Cumberland	25,000.00
Essex	35,000.00
Gloucester	25,000.00
Hudson	24,000.00
Hunterdon	
Mercer	15,000.00
Middlesex	35,000.00
Monmouth	21,000.00
Morris	
Ocean	16,000.00
Passaic	24,000.00
Salem	15,000.00
Somerset	16,000.00
Sussex	20,000.00
Union	27,000.00
Warren	19,000.00
	\$425,000.00

\$125,000.00 Funds available for Distribution  
75,000.00 Reserve for items of engineering, inspection, and administration.

\$500,000.00 total S. A. Fund.

### GENERAL

There are striking examples in each County of the State of the excellent results procured from the expenditure of the State Aid and Motor Vehicle Aid moneys. Practically every County has adopted a hard surface policy, so that the roads of today being built or reconstructed are at this time or will be in a few years good hard paved, smooth riding roads suitable for traffic at all seasons of the year.

County	% of Total Square Miles	% of Total Mileage	% of Total Population	Average Percentage	County's share of \$2,000,000.00
Atlantic	7.421	6.026	2.658	3.368	\$107,360.00
Bergen	2.993	8.918	6.676	6.195	123,900.00
Burlington	10.056	7.865	2.591	6.837	136,740.00
Camden	2.751	3.656	6.036	4.148	82,960.00
Cape May	5.483	4.160	.616	3.419	68,380.00
Cumberland	8.199	2.358	1.944	4.167	83,340.00
Essex	1.577	6.014	20.662	9.417	188,340.00
Gloucester	4.151	3.545	1.528	3.074	61,480.00
Hudson	.735	1.473	19.935	7.381	147,620.00
Hunterdon	5.339	2.313	1.042	2.898	57,960.00
Mercer	2.772	5.666	5.066	4.501	90,020.00
Middlesex	3.945	9.731	5.144	6.273	125,460.00
Monmouth	6.511	6.774	3.325	5.546	110,920.00
Morris	5.838	6.026	2.620	4.828	96,560.00
Ocean	9.129	2.863	.702	4.231	84,620.00
Passaic	2.415	7.891	8.212	6.172	123,440.00
Salem	4.735	4.293	1.159	1.395	67,900.00
Somerset	3.709	4.218	1.521	3.159	63,180.00
Sussex	6.509	2.089	.789	3.129	62,580.00
Union	1.276	2.336	6.342	1.318	66,360.00
Warren	4.423	1.755	1.432	1.544	50,880.00

Disposition—1921 Motor Vehicle Aid Fund	
State Highway Maintenance	\$1,855,000.00
Toll Bridge Acquisition	250,000.00
Detours	150,000.00
Amboy Bridge Repairs	100,000.00
Emergency Fund to Counties	225,000.00
Snow Removal	100,000.00
Operation of Bridges	45,000.00
Department Administration	150,000.00

Township Aid	\$210,000.00
Motor Vehicle Department expenses	292,000.00
	\$502,000.00
Motor Vehicle Aid to Counties	\$3,377,000.00
	2,000,000.00
	\$5,377,000.00
Total estimated collections	\$5,400,000.00



Mileage under construction, under contract ready for construction or completed during the year 1921 for the several different types of pavement

Type of Road		Under Contract		Ready for Con.		Completed		Totals by Types	
		By Muni.	Total	By Muni.	Total	By Muni.	Total	By Muni.	Total
Sheet Asphalt on Concrete Base	1 State 2 County 1 Twp.	4,636 4,661	9,297	1,610 0.090	1,700	11,120	11,120	4,636 17,391 0.090	22,117
Sheet Asphalt on Stone Base	1 2	4,304	4,304	0.0	0.0	17,435	17,435	21,739	21,739
Bituminous Concrete on Concrete Base	1 2 3	17,978 3,796	21,774	0.0	0.0	2,965 27,200	30,165	22,943 30,296	53,239
Bituminous Concrete on Stone Base	1 2 3	3,150	3,150	0.0	0.0	15,175	15,175	18,325	18,325
Concrete	1 2 3	40,181 7,569	47,750	1,420	1,420	45,358 43,905	89,263	85,519 52,894	138,433
Brick	1 2 3		0.0	0.0	0.0	0,460	0,460	0,460	0,460
Block	1 2 3	3,334	3,334	0,660 0.090	0,750	1,110	1,110	5,104 0.090	5,194
Macadam, Penetration	1 2 3	1,095 2,030	3,125	0,470	0,470	12,218	12,218	1,095 14,248 0,470	15,813
Macadam, Water Bound	1 2 3		11,800	2,530 6,310	8,740	21,219 26,390	47,609	23,749 44,400	68,149
Macadam, Surface Treated	1 2 3		2,000	3,500	3,500	0.0	0.0	5,500	5,500
Gravel	1 2 3	16,052 25,045 25,200	66,297	3,200 3,500	45,700	7,442 57,317 43,830	109,589	23,494 85,562 112,530	221,586
Cinders	1 2 3		0,750	0,800	0,800	2,500	2,500	4,050	4,050
Slag	1 2 3		0.0	0.0	0.0	1,000	1,000	1,000	1,000
Other Types	1 2 3	0,608 3,680	4,288	0.0	0.0	0.0	0.0	0,608 3,680	4,288
Total			179,169		63,080		337,644		579,893

## TOWNSHIP AID

Chapter 217, Public Laws of 1916, and amendments thereto provide for the apportionment of \$210,000.00 taken from the Motor Vehicle Fund, among the Townships of the State applying for the same to be used in the improvement of unimproved Township roads. The Townships are called upon to supply one-quarter of the estimated cost of the improvement, which amount may be raised by tax, bond issue, or public subscription.

The total of apportionment of \$210,000.00 is allotted on

Below is given a list of Township allotments for the year 1921, which begins July 1, 1921. There is also given below a list showing the disposition made of cancellation funds of the Township Road money, which was collected through the cancellation by the Department of allotments to Townships which after having made application made no move to use the money apportioned to them.

*Continued on next page*

County	Township	Road	State Share	Townships Share	Length Miles	Type
Bergen	North	Unallotted	\$50,000.00 available for distribution			
Bergen	Franklin	Cedar Hill Ave.	\$1,000.00	\$1,000.00	1	Bit. Mac.
Bergen	Franklin	Rivine Ave.	4,000.00	1,500.00	1	Bit. Mac.
Bergen	Chatham	Crosswicks-Fishkill	400.00		2 1/2	Cinders
Bergen	Chatham	Crosswicks-Chestersfield, Sec. 2	1,288.00	429.44		
Burlington	Madison	Commerce Entrance	5,114.28	1,000.00		Cinders
Burlington	Madison	Liberalde Indian Mills	1,000.00	1,000.00	2 1/2	Gravel
Burlington	Madison	Liberalde Indian Mills-Laumont	5,700.00	904.00	1	Gravel
Camden	Bergen	Bergen-Tuckson	1,000.00	1,000.00	1	
Camden	Camden	Kearwood-Indian	1,800.00	1,000.00	1 1/2	Gravel
Camden	Camden	Irish Road	2,400.00	800.00	2	Gravel
Camden	Haddon	Crystal Lake Ave.	100.00	100.00	1 1/2	Gravel
Camden	Amherst	Morristown & White Horse	4,000.00	2,734.00	1 1/2	Gravel
Cape May	Dennis	Clairmont Road	1,200.00	400.00	1 1/2	Gravel
Cape May	Lower	Shunpike & Stimpson Lane	1,000.00	1,000.00	1 1/2	Gravel
Cape May	Middle	Court House Dray Creek	1,200.00	400.00	1 1/2	Gravel
Cape May	Middle	Swanton-Goshen	1,000.00	400.00	1	Gravel
Cape May	Middle	Wildwood Jet. Road	1,200.00	400.00	1	Gravel
Cape May	Upper	Commonwealth Ave. & connect.	1,800.00	600.00	1 1/2	Gravel
Unallotted balance available for distribution, \$4,000.00						
Cumberland	Deerfield	Calves Sta-Silver Lake	1,000.00	1,000.00	1 1/2	Gravel
Cumberland	Deerfield	Lower Lane	1,000.00	1,000.00	1 1/2	Gravel
Cumberland	Deerfield	Calves Sta-Woodruff	2,000.00	666.67	4	Gravel
Cumberland	Deerfield	Deerfield Seeley	2,000.00	666.67	2 1/2	Gravel
Essex	A total of \$10,000.00 available as no requests for aid were made.					
Gloucester	Mantua	Mantua Knights Run	5,000.00	1,666.67	3	Gravel
Gloucester	Montroe	Williamstown-Glassboro	2,000.00	666.67	1	Gravel
Gloucester	Montroe	Williamstown-Sicklerville	3,000.00	1,000.00		
Hudson	N. Bergen	Dalltown Road	10,000.00	3,333.33	174	Con. Blk.
Hunterdon	Alexandria	Everittstown-Pittstown	7,000.00	2,000.00	5	Mac.
Hunterdon	W. Amwell	Old Brunswick Pike	1,000.00	1,000.00	4	Mac.
Mercer	No application submitted, therefore a total of \$10,000.00 is available.					
Middlesex	Piscataway	New Market Avenue	10,000.00	3,500.00	1	Mac.
Monmouth	Middletown	Palmer Avenue	2,500.00	2,500.00	1	Gravel
Monmouth	Shrewsbury	Palmer Avenue	2,600.00	2,600.00	1.086	Gravel
Monmouth	The sum of \$4,000.00 remains unallotted					
Morris	Washington	Naughtlight Bartley	5,400.00	1,800.00	3.32	Mac.
Morris	Mendham	Naughtlight Gladstone	4,600.00	1,533.33	2.3	Mac.
Ocean	No requests submitted, therefore a total of \$10,000.00 available.					
Passaic	No requests submitted, therefore a total of \$10,000.00 available.					
Salem	Mannington	Hawk's Bridge Road	2,000.00	666.67	1 1/2	Cinders
Salem	Pittsgrove	Grier's Lane	1,500.00	500.00	1 1/2	Gravel
Salem	Pittsgrove	Hannon's Lane	1,000.00	333.34	1	Gravel
Salem	Pittsgrove	Willow Grove Road	1,000.00	333.34	1	Gravel
Salem	W. Penns Neck	Asbury-Pennsville	1,500.00	1,500.00	1 1/2	Gravel
Somerset	Bedminster	Gladstone-Pottersville, Sec. 2	2,000.00	2,000.00	0.524	Mac.
Somerset	Montgomery	Bolmer Cor. Blawenburg	1,000.00	2,666.67	1.38	Mac.
Sussex	Sparta	Sparta-Woodport	7,500.00	2,500.00	3.68	Gravel
Sussex	Fredon	Newton-Swatswood	2,500.00	833.34	1	Gravel
Union	A total of \$10,000.00 allotted, no requests submitted.					
Warren	Franklin	Broadway-Asbury	600.00	1,000.00		
Warren	Hardwick	Blawenburg-Stillwater	4,500.00	1,500.00	4	Gravel
Warren	Pohatcong	Forge-Springtown, Sec. 2	4,500.00	1,500.00	1.07	Mac.

## DISPOSITION OF CANCELLATION FUND

Burlington	Chesterfield	Crosswicks-Chesterfield, Sec. 2	1,712.00	1,570.67	2	
Camden	Haddon	Crystal Lake Ave.	100.00	400.00	.13	Gravel
Camden	Winslow	Fleming Tpk.	3,600.00	1,200.00	2 1/2	Gravel
Camden	Winslow	Old Brooklyn and Chew's Landing	6,000.00	2,000.00	2 3/4	Gravel
Camden	Winslow	Central Avenue	1,500.00	1,500.00	3	Gravel
Cumberland	Deerfield	Finley Sta.-Silver Lake	2,100.00	700.00	1 3/4	
Cumberland	Deerfield	Love Lane	500.00	166.66	1 1/2	
Cumberland	Deerfield	Finley Sta. Woodruff	4,000.00	1,333.33	4	
Cumberland	Deerfield	Grier's Lane	3,000.00	1,000.00	1 1/4	
Cumberland	Deerfield	Center Dist.	1,000.00	1,333.00	2	Gravel
Cumberland	Deerfield	Northville Road	6,000.00	2,000.00	2 1/4	Gravel
Cumberland	Deerfield	Silver Lake, Sec. 2	3,000.00	1,000.00	1 1/2	Gravel
Cumberland	Deerfield	Finley Sta.-Seeley, Sec. 2	3,000.00	1,000.00	1 1/2	Gravel
Cumberland	Deerfield	Springtown-Salem	1,500.00	500.00	3 1/4	
Cumberland	Greenwich	Croton-Quakerstown	3,498.52	1,166.18	3.228	Mac.
Hunterdon	Franklin	Ralston-Gladstone	3,750.00	1,250.00	.893	Mac.
Morris	Chester	Ralston-Gladstone	1,286.25	428.75	2.3	Mac.
Morris	Mendham	Willow Grove Road	2,750.00	916.67	2	Gravel
Salem	Pittsgrove	Gladstone-Pottersville, Sec. 2	808.70	808.70	.524	Mac.
Some-set	Bedminster	\$10,000.00 available.				
Some-set	Bernards	Andover-Greendale	1,200.00	400.00	1.1	Gravel
Sussex	Fredon					
Sussex	Hampton & Stillwater					
Warren	Lopatcong	Newton Swartswood Road	8,098.62			
		Delaware River Road	3,000.00	1,000.00	3	



STATUS OF HIGHWAY CONSTRUCTION—LISTED BY COUNTIES  
In accordance with Chapter 14, Laws 1917, and amendments thereto June, 1918, to November, 1921

County	Total Mileage	Construction by State Miles Completed	Miles under Contract	County Reimbursement Construction by Miles Completed	Miles under Contract	Total Mileage Completed or under Contract	Total Construction Cost
Atlantic	54.8	14.787	—	9.87	5.69	30.347	\$1,377,177.62
Morris	57.8	9.846	14.939	1.588	3.39	29.733	2,022,336.79
Gloucester	31.4	12.155	—	5.0	—	17.155	654,730.55
Salem	29.2	3.165	—	10.798	—	13.963	429,651.41
Warren	47.7	—	—	13.457	—	13.457	968,599.34
Middlesex	43.8	12.601	49	—	—	13.091	1,080,894.45
Cape May	30.2	11.654	—	—	—	11.654	521,005.44
Monmouth	54.8	7.635	3.621	—	—	11.256	666,094.96
Burlington	29.9	6.786	4.044	—	—	10.830	898,458.39
Camden	32.9	10.712	—	—	—	10.712	598,286.38
Mercer	34.1	9.207	.632	—	—	9.839	601,860.76
Somerset	50.3	6.482	—	3.392	—	8.874	537,936.88
Cumberland	40.1	—	—	—	8.305	8.305	458,804.07
Sussex	21.50	—	7.05	—	—	7.05	477,377.57
Union	21.5	1.034	4.598	45	—	6.082	701,501.44
Hunterdon	21.1	—	4.182	—	—	4.182	425,940.40
Bergen	10.0	2.424	—	.652	—	3.076	880,513.41
Passaic	24.2	1.162	—	1.39	—	2.552	158,667.39
Ocean	52.3	—	—	—	—	—	—
Essex	24.1	—	—	—	—	—	—
Hudson	4.7	—	—	—	—	—	—
	725.8	109.650	39.556	32.110	30.842	212.158	\$13,459,837.25

STATE HIGHWAY CONSTRUCTION  
Schedule of Completed Concrete Roads

Route Section	Location	Length in Miles	Total Mileage by Route	Date of Contract	Date Completed or Opened for Traffic	Paved Width ft.	Thickness at Center (in.)	Thickness at Sides (in.)	Mix
1 1	Metuchen to Menlo Park	1.811	—	6-10-18	6-1-19	18	10 1/2	8	1-1 1/2-3
1 1A	Lake Ave. to Middlesex Ave., Metuchen	.283	—	9-20-19	9-1-20	18	10 1/2	8	1-2 -3
1 2	Menlo Park to Rahway	3.548	—	8-12-18	12-10-19	20	10 1/2	8	1-2 -3
1 3	Robbinsville to Windsor	2.55	—	7-14-19	11-13-20	18	10 1/2	8	1-2 -3
1 4	Windsor to Hightstown	1.453	—	5-27-19	12-20-19	18	10 1/2	8	1-2 3
1 5	Hightstown-Millstone River	1.44	—	4-19-20	9-26-21	18	10 1/2	8	1-1 1/2-3
1 8	Leesville Ave. to Milton Ave., Rahway	.918	14.007	9- 8-20	11-13-20	29	10	8	1-1 1/2-3
2 1	Burlington-Roebling	5.0	5.0	9- 5-18	6-30-21	18	8 3/4	6	1-2 -3
3 1	Hammononton to Ancora	2.778	—	8-18-18	1- 1-20	18	8 3/4	6	1-2 -3
3 2	Atco to Berlin	2.987	—	6-14-18	11- 7-19	18	8 3/4	6	1-1 1/2-3
3 3	Elwood to Da Costa	3.873	—	5-20-19	1- 5-20	18	8 3/4	6	1-2 -3
3 4	Egg Harbor to Elwood	3.867	—	5-20-19	12-13-20	18	8 3/4	6	1-2 -3
3 5	Da Costa to Hammononton	4.418	—	5-27-19	10-20-20	18	8 3/4	6	1-2 -3
3 6	Absecon to Egg Harbor	9.87	—	10- 1-19	8-16-21	20	8 3/4	6	1-2 -3
3 1-3	Ancora to Atco	4.947	14.740	5- 3-21	10-26-21	20	8 3/4	6	1-2 -4
4 1	Red Bank to Middletown	3.5	—	7-23-18	6-30-19	18	8 3/4	6	1-1 1/2-3
4 1A	Navesink River to Conover Lane	.221	—	8-15-19	12-20-19	18	8 1/2	6	1-2 -3
4 2	Middletown to Betsey Ross Farm	2.923	—	5-26-19	12-27-19	18	8 1/2	6	1-2 -3
4 3	Broadway to Scott Ave., So. Amboy	.824	—	2-12-20	9-10-20	20	8 1/2	6	1-2 -3
4 3A	City Line to Stevens Ave., So. Amboy	.582	—	5- 3-20	9- 8-21	32-53	8	8	1-2 -4
A 4	Keyport	.446	8.496	5- 3-21	9-30-21	22-46	12	12	1-1 1/2-3
5 1B	Morris Plains to Morristown City Line	.886	—	5- 2-19	11-15-19	22	10 1/2	8	1-2 -3
5 1	Main Street, Rockaway	.631	1.517	9- 6-18	12-30-18	25	8	8	1-2 -3
6 1	Mullica Hill-Mantua	9.15	—	4-14-19	12-17-20	18	8 3/4	6	1-2 -3
6 2	Woodstown-Mullica Hill	7.248	—	4-17-20	8-15-21	18	8 3/4	6	1-1 1/2-3
6 4A	Cumberland Co. Line-Shirley	.82	13.218	5-31-21	10-20-21	20	8	8	1-2 -4
8 1	Riverdale to Pompton River	4.331	—	7-24-19	12-18-20	18	8 1/2	6	1-2 -3
8 3	Whites Bridge to Bloomingdale Center	1.162	5.493	4-28-20	12-29-20	18	8 1/2	6	1-1 1/2-3
9 3	Lenox Ave. to Elmer St., Westfield	.116	.116	10-16-20	11- 6-20	22	10 1/2	9 1/4	1-1 1/2-3
10 3	Anderson Ave., Fort Lee-Broad Ave., Morsemor	1.329	—	5-26-20	5-10-21	20	10 1/2	8	1-1 1/2-3
10 4	Bergen Turnpike, Section 2	.652	1.981	7- 9-19	12-15-19	18 1/4	9	9	1-2 -3
B 12	Morris Tpk. 1 mile west of New Village	.909	.909	—	11- 1-12	14-18	4-8	5-7	1-2 1/2-5
13 1	Kingston to Ten Mile Run	3.665	—	4-29-18	6-10-20	18	10 1/2	8	1-1 1/2-3
13 2	Ten Mile Run to Three Mile Run	4.526	—	11- 7-18	8- 1-20	18	10 1/2	8	1-2 -3
13 3	Three Mile Run to New Brunswick	3.841	—	7-21-19	12- 9-20	18	10 1/2	8	1-2 -3
13 4	Kingston to Princeton	1.764	13.796	2- 4-20	12- 9-20	18	10 1/2	8	1-2 -3
14 1	Cape May to Rio Grande	4.639	—	11-15-18	12- 8-20	18	8 3/4	6	1-2 -3
14 2	Rio Grande to Wildwood Jct.	3.575	—	5-15-19	2-24-20	18	8 3/4	6	1-2 -3
14 3	Wildwood Jct.-Cape May Court House	2.025	—	5-15-19	12-15-19	18	8 3/4	6	1-2 -3
14 4	Cape May Court House	1.415	11.654	6- 7-20	2- 2-21	18	8 3/4	6	1-1 1/2-3
16 1	Bernardsville-Mine Brook	2.392	2.392	5-12-20	5-11-21	18	8 1/2	6	1-2 -4

B Experimental Concrete Road Construction. 113.319  
A Total mileage of Route 4 Section 4 Keyport .783—4.46 Concrete, .337 Amesite.



Lincoln Highway, near Metuchen (Courtesy Portland Cement Association)

## Concrete Facts for Concrete Road Builders

1. Our plant at Vulcanite, Warren County, New Jersey, has a capacity of 2,000,000 tons a year—two million!
2. We make immediate shipments to concrete road jobs anywhere.
3. We believe that service is just as important to you as good cement. Our customers say they get both. Let's get together and talk cement.

VULCANITE PORTLAND CEMENT CO.

PHILADELPHIA

BOSTON

NEW YORK

## MERRY CHRISTMAS TO YOU FROM EDISON

OUR ENTIRE ORGANIZATION DESIRES TO TAKE THIS OPPORTUNITY TO EXPRESS THE PLEASURE WE DERIVE FROM OUR BUSINESS RELATIONS WITH THE NEW JERSEY STATE HIGHWAY DEPARTMENT, AND TO WISH THE DEPARTMENT AND THE "HIGHWAYMAN" A MERRY CHRISTMAS AND A HAPPY AND SUCCESSFUL NEW YEAR.

EDISON PORTLAND CEMENT CO.

DECEMBER, 1921.



## ALONG THE ROAD

### Get Out For a Sleighride in the Old Gas Bus!

Do you get what you should out of your car in winter?

Not by a jug-full, if you're like most auto owners—

You keep her stuck up in the garage, except when you have to take her out on business; and then you put on all the curtains or keep all the windows shut tight.

Say, didn't you ever use to go sleigh riding? A little fresh air on your face didn't do any damage, did it.—except to blow some of the cigar ashes out of your whiskers; (or the Pompeian Tint off your nose, *gentle reader!*)

You know what a razor edge such a sleigh ride used to put on the appetite for Christmas and New Year's dinner—how it pepped up the whole party, and put cheeks aglow, and eyes sparkling, and lighted a jovial flame inside, under the left hand upper vest pocket!

Why not a real old fashioned sleigh ride (on rubber) this Christmas?—or anytime during the winter, for that matter. Wrap up warm; let in the air and sunshine; and try it!

Make up a party to give some old friend a surprise for the holiday season. Take the kids along and make a real time of it—remember how you look back on the Christmas Week trip to Grandpa's!

And you do not know, until you get out to see it, what a fairy land the first snow will make of the old familiar trails.

Try the prescription above;—and if you're not satisfied with the results, let us know, and, by heck, we'll refund your subscription price!



Clean Through!  
The result of too heavy traffic

### A Lesson for Shippers Who Overload Trucks!

When trucks and bridges meet out—

At all, because the bridge can't take the load, the water never built to bear.

The bridge, somewhere (somewhere in a neighboring state) was so weakened that an empty truck broke through it.

The New Jersey State Highway Department is on the alert to avoid anything like this by making a careful inspection of

bridges, posting safe loads, and by lambing scales operated by the New Jersey State Motor Vehicle Department to prevent overloading of vehicles.

### Concrete Philosophy

By CORDROY LEE

Why is it that one dollar spent for taxes to build and maintain good roads looks bigger than \$5.00 spent for tires, repairs, and gas?

Some guys have to go through life with their cut-out wide open, so folks will know their movin'!

*Highwayman.* Isn't it a better investment to spend money to build a permanent road to begin with, than to pay it out in the attempt to keep a poor road in repair?

*Moss-back:* I don't know nothin' about investments; but a narrow dirt road was good enough for my grandfather, and I guess it's good enough fer me.

Take it from me, the bird who is always hollerin' about his "right of way", has got the wrong prescription for breaking any records.



Route No. 4  
Between Milledown and Betty Ross Tavern

### The Highwayman is Out For More and Better Roads in New Jersey

January, 1922  
Vol. I  
No. 6

### One New Year's Resolution is Enough

Getting around among the boys, I've heard some New Year's resolutions.

They make good reading—I wish there was room for a complete list of 'em here!

But say, even if I introduced you to every one of these Good Intentions now, how many of 'em would you be able to recognize by this next month? Most of 'em, by that time, will be just *paving material*. (You've heard that a certain place—not under the jurisdiction of the Highway Department—is paved with 'em.)

Fact is, men, most of us make too darn many resolutions. They're all about *details*. We let the Main Thing slide.

The Main Thing, is to *keep your mind on the job*.

"The job" may be play; or work. Personal or business. Hands, or head. Planning, or executing. For the passing minute; or for months ahead. But—keep your *head* on it!

Most accidents are the direct results of a *wandering mind*. It may be an extra good mind, even a brilliant one—but if it won't stay where you put it, till the job is finished, it's not much use. Either to your employer or to you.

Also, *poor work* is the direct result of a wandering mind. It comes back to the



The Highwayman Wants to Know—  
Which Road is the More Expensive?

Keep your mind on your job!

### Which Is the Most Expensive?

In this issue you will find the road program for the coming year.

Some folks will read it with the greatest satisfaction. They will see that it means so many more links completed in the carefully thought out system of highways for the State.

But there will be some kickers—some of the fellows who never see anything in any public improvement, except a few dollars added to their taxes.

Just the other day I met up with one of these guys. His farm has been for sale for two years. It happens to be on one of the State Highways. Last summer this road was hard-surfaced. Our friend spent most of his time, while this work was being done, sitting on the porch and hollering about what it would cost.

So far as I know, this man's taxes are no bigger this year than they were last. But I do happen to know that he raised the price of his farm \$2000.00.

Can you beat it?



This bit of road is an important link in the Highway System of South Jersey, but before it was hard surfaced it was almost impassable for several weeks each year. (Route 6—Between Salem and Mullica Hill at Old Mau's Creek)

The Highwayman

J. C. BRAGG  
J. H. BAUMANN

—CIVILS. In Bridgeton Evening News.



Concrete Road from Bridgeville to Hope, N. J., and scene beyond—Washington on Macadam road near Oxford Mountain

## New Bridge to Eliminate Dangerous Curve on Way to Atlantic City

Every motorist knows to what extent especially sharp turns slow up his progress; or when a sharp turn appears unexpectedly gives him a shock and necessitates fast thinking and quick action on his part in order to avoid an accident. Such a condition as described above has existed for a long time on Route No. 4, just north of New Gretna, at what is known as Job's Creek Bridge. Approaching this bridge in the direction of Atlantic City one does not realize that the south end of the bridge marks the beginning of a thirty-five degree turn. This combined with the fact that the bridge at this point is not wide enough to allow two vehicles on it at a time, has made it a dangerous spot to be remembered.

We understand that several fatal accidents have happened at this point. We are glad to inform motorists on their way to and from Atlantic City or other local points that this dangerous condition will be eliminated by the construction of a new bridge early next year. We hope and expect this project to be completed in time for the spring and summer traffic.

The fill approaches for the new bridge on the changed alignment and easier curve have been made for some time, so that it should be settled ready for surface paving at the time the bridge is completed. Elimination of other sharp turns along this route are under consideration. In many cases the attitude of property owners from whom property has to be acquired to make improvements at dangerous turns affects the progress of the work to a great extent. The Department wishes to express its appreciation for the very fair treatment which our representatives have been accorded by the majority of property owners, where they have been met upon a fair basis in our negotiations for the acquirement of property, thereby contributing to the general welfare of the State at large.

## The Value of War Surplus Material in Snow Removal

The photo below shows one of the 10-ton Holt Tractor Plows used on Snow Removal.

Snow removal was started in New Jersey in 1919 with twelve truck plows. For the winter of 1921-1922, there are assigned to this work, eighty-two truck plows, two tractor locomotive type plows, three rotary snow brooms, and fifteen maintenance patrol units equipped with tractor and road machines. Approximately seven hundred and ninety miles of highway are being taken care of by the above.

The above extensive program is made possible by the use of War Surplus Equipment, practically all truck plows being mounted on trucks received from the Government. The balance of the equipment has been purchased with State funds. The equipment used in snow removal is the equipment that has been used throughout the active season on maintenance and road construction and would ordinarily be idle and in dead storage, were it not for the snow work. If it were necessary to hire, equip, and store an amount of equipment equivalent to the above, the cost to the State for rental alone, exclusive of all labor and supplies, would be approximately \$175,000 per year.

Probably the most interesting part of the Snow Removal from the equipment point of view, is the equipping of the trucks for snow work. Trucks are brought in from various locations around the State around the middle of November, and the entire shop forces put on this work. Approximately two weeks are required to attach the plows and equip same and make proper adjustments that are necessary before the plows are sent out. This year approximately ninety per cent. of the plows were equipped and distributed on the Snow Removal Sections by December 1st, the balance, trucks that required heavier repairs than the average, were sent out early in December.

Awaiting call to snow duty.

N. C. APPLGATE, Superintendent of Equipment.



The old way (by hand) slow and—

## Snow Removal Saves Pavement

On the first snow fall of the season and its prompt removal had no doubt been in the mind of many of your readers. The heavy snow of last winter and the successful maintenance of the highways by the Highway Department.

It will be recalled that very little inconvenience was suffered by motorists traveling our State Highways, yet the expenditures were insignificant as compared with the benefits derived from uninterrupted traffic on State truck lines.

These benefits while not readily expressed in dollars and cents are not the only ones derived by snow-removal. The removal of snow of whatever depth from the paved portions of the highway has a direct bearing upon the wearing qualities of the pavement itself. The benefit is twofold.

First, it facilitates drainage. We can all of us recall the days before any organized attempt was made at snow removal. Then, the first vehicle thru, after a snowfall, led the way for all others. Deep ruts were formed which were both wheel tracks and drainage channels. No attempt was made to open ditches and traffic had to get along the best way possible until the county authorities dug out deep drifts and opened ditches. Many times, however, this was after melting snow had made rivers of the wheel tracks and sloughs of the low places. The effect upon the sub-grade and its bearing power was in many, many cases disastrous.

Second, it distributes traffic. As pointed out above, snowfall on the highway causes traffic to travel in the ruts formed, thereby concentrating within certain narrow

## The Battle With Snow



expensive, with traffic held up.

spaces the weight and wear that would otherwise be distributed over the entire paved width. The effect of this concentration is marked in varying degrees in all types of pavement from concrete to gravel. In the concrete pavement it means spalled joints, cracked slab corners and wheel-tracked surface. In the bituminous pavement surface badly rutted and broken, while with the gravel roads oftentimes the "bottomless pit".

The direct benefits of snow removal to the pavement itself is more readily seen by the layman in the case of gravel roads, where constant maintenance is the price of easy riding. Here the prompt removal of each snowfall makes it possible for the roadman to keep the surface in fairly good condition throughout the winter; a condition that would be impossible if each snow fall were left to be removed by a rise in temperature or rainfall.

Thus it can readily be seen that prompt removal of snow from all classes of pavement is not only a great benefit to the traveling public, but a benefit to the pavement itself, and last but not least a saving in the cost of maintenance and reconstruction. In plain English it's a "money saver."

H. D. ROBBINS, Division Construction Engineer.

## Removal of Snow as It Affects Sleighs

In the north and north-west parts of the State our attention has been called to the difficulty experienced by farmers who find it necessary to use sleighs over the little-traveled by-roads from their farms or homes to the main



Tom Wasser's new slogan is "keep the roads open." Plows like the above (Nash quads with Good-Roads snow plows) are started before the snow stops, will do the trick

highways with their load of milk or farm products when it becomes practically impossible for them to continue over the highway which has been cleared of snow. The same situation exists, with regard to the town, in transporting his goods to the farmer who lives on the little traveled by-roads.

In order to solve this problem in an effort to make the highways useful to all of the people all of the year, we have written to several of our neighboring states to find out what they do under the circumstances. One State has tried out the experiment of rolling the snow in order to compact it with the idea that it would then be fit for either wheel or sleigh traffic. It is reported that where there is no heavy truck traffic this has proved more satisfactory than scraping. On the other hand, if there is any degree of heavy traffic it cuts through the rolled snow and makes conditions worse than ever. The erection of snow fences was mentioned as being a help to prevent snow drifting to any considerable depth in road cuts. Another State in commenting upon their snow removal operations states that where the snow removal has been at all successful it has been in those sections where all of the snow was removed from the pavement. The removal of all the snow from the pavement has a decided good effect upon the condition of the road and its maintenance cost and life, in addition to the advantages of having the road opened to traffic throughout the year. It is pointed out that leaving any snow on the pavement at all establishes a very dangerous condition for the traffic using the highway in addition to forming ruts due to the snow which has a disastrous effect upon the pavement.

It is pointed out further that milk routes are usually formed along the highways where the milk is picked up by trucks at points where it is left by the farmer's vehicle. This would seem to be a solution for the farmer's difficulty by a cooperative movement along the line suggested. Where enough snow has been left to pack down to two inches it was found that the two inches of compacted snow soon melted leaving the pavement bare or becoming very slippery, causing a very dangerous condition.

The majority of opinion expressed by other States is that snow removal must, to be successful, include the removal of all snow from the highway. The net problem to face is whether snow removal is profitable, considering that by far the greater percentage of wheeled vehicles are used in the present day and the additional help that can be afforded to these vehicles by the removal of snow in addition to the very beneficial effect the snow removal has upon the pavement, there can be no doubt that removal of snow from the highway serves the large majority of people using them to great advantage.

## Snow Removal by Machinery

The photo at the left shows some Nash-Quads ready for snow duty with Good Roads snow plows in place ready for action. Seeing these snow pictures reminds us of the little snow flurry we had on Sunday, December 4. The Weather Bureau from the nature of reports which they received could not advise the Highway Department whether the snow would amount to anything or not. It seemed to be a fifty-fifty chance that it would amount to something. It was finally decided to call out the snow removal forces, because the beginning of the snow is oftentimes the most critical time. If the equipment does not start out when there is two or three inches of snow on the ground, the snow may become deep enough to prevent successful removal by mechanical methods and, therefore, necessitate the very expensive work of hand removal in places.

State Highway Engineer Wasser decided that it was in the interest of economy to start the work of snow removal organization to work after three or four inches of snow had fallen for the reasons stated above and due to the fact that a wet snow might freeze on the pavements and if additional snow should come it would cause great inconvenience and danger to traffic. After it became apparent that the snow was over Sunday evening word was sent out to the headquarters of the various contractors and snow removal outfits to put up their equipment for the night.

—H. C. S.



## 1922 Program State Highway Reimbursement Construction

### EXTRACTS FROM RESOLUTIONS OF COUNTIES

**Atlantic County, Route 4**—Said portion of Route 4 between Smithville and the Mullica River Bridge by the way of Johnstown, about **3 3/4 Miles**

**Bergen County, Route 10**—That portion of Route No. 10, being Bergen Turnpike in Little Ferry, Ridgefield Park and Ridgefield, also that portion of that part of the route known as the Blue Route from the easterly end of Brook Lane to Anderson Avenue to Fort Lee.

**Bergen County, Route 10**—That portion of Route No. 10, being Essex Street and Hudson Street in Hackensack, called also Bergen Turnpike. **6 Miles**

**Camden County, Route 3**—That portion of Route 3 from Camden City Line to the present concrete pavement southeast of Berlin. **13 Miles**

**Cape May County, Route 14**—Route 14, for three miles or more south of Cape May Court House. **4 Miles**

**Cumberland County, Routes 6 & 15**—That portion of Route No. 6 of the State Highway System beginning at the dividing line between the counties of Cumberland and Salem and extending over what was formerly known as the Shiloh Turnpike, via the village of Shiloh, to the City of Bridgeton, a distance of approximately six miles. **6 Miles**

Grading. That portion of Route 15 of the State Highway System beginning at the connecting point with Route 6 of the State Highway System at East Bridgeton, and extending eastwardly over what is commonly known and designated as the Bridgeton and Millville Turnpike, to the paved surface of said State Highway on west Main Street in the City of Millville. **10 Miles**

**Gloucester County, Route 6**—Route 6, Mantua Avenue from end of improved Topeka pavement northwardly to Salem Avenue, and on Broad Street from northerly edge of bridge over Woodbury Creek northwardly to the W. J. & S. R. R. **1.5 Miles**

**Gloucester County, Route 6**—Route 6, Section 6, in accordance with the standard plans of the State Highway Department. **5.028 Miles**

**Mercer County, Route 2**—South Broad Street from Trenton City Line to northerly terminus of the White Horse Road and a part of State Highway Route, No. 2. **1.3 Miles**

**Monmouth County, Route 4**—That portion of Route No. 4, lying within the territorial limits of the Borough of Avon in the County of Monmouth aforesaid, namely Main Street, to such a width as shall be approved by the State Highway Commission, or any portion which may be agreed to between the Board of Chosen Freeholders of the County of Monmouth and the State Highway Commission.

That portion of Route No. 4, namely Riverside Avenue, from Bridge Avenue to Front Street, thence along Front Street to Maple Avenue, thence along Maple Avenue to Bergen Place, thence over new right of way along New York and Long Branch Railroad to Broad Street, all in the Borough of Red Bank in said County.

That portion of Route No. 4, namely beginning at the intersection of the Monmouth Road and its intersection with the Eatontown and Long Branch Boulevard, thence running southwardly through the Borough of West Long Branch to Cedar Avenue, thence eastwardly along Cedar Avenue to Norwood Avenue, to the south side of Roseld Avenue in the Borough of Deal, N. J.

That portion of Route No. 4, namely beginning at the junction of Sea Girt Avenue on Route No. 4 with Parker Avenue and running thence along Sea Girt Avenue to its intersection with Broad Street in the Borough of Manasquan. **5.5 Miles**

**Ocean County**—(A) Starting at a point on said Route No. 4 in the Borough of Point Pleasant Beach, Ocean County, at the Manasquan River and extending on said Route toward Lakewood a distance of one mile.

(B) Starting at a point on said Route No. 4 in the township of Brick, Ocean County, at the Post Office in

the Village of Laurelton and extending toward Lakewood a distance of four miles;

(C) Starting at a point on said Route No. 4 in the Township of Lakewood, Ocean County, at or near the intersection of Main Street and Madison Avenue and extending toward Toms River a distance of one mile;

(D) Starting at a point on said Route No. 4 in the Township of Dover, Ocean County, at the intersection of the highways at the Cemetery, north of the Village of Toms River and extending toward Tuckerton, a distance of one and one-half miles;

(E) Starting at a point on said Route No. 4 in the Township of Union, Ocean County, and extending through the Village at Barnegat a distance of one mile;

(F) Starting at a point on said Route No. 4 in the Borough of Tuckerton, Ocean County, and extending through the Borough of Tuckerton, a distance of one and one-half miles. **10 Miles**

**Passaic County, Route 11**—That portion of Route 11, Main Street in the County of Passaic. **1 Mile**

**Salem County, Route 6**—That portion of Route 6 which lies between Salem and Marlboro.

Pavement. **3 Miles**  
Grading. **6 1/2 Miles**

The unfinished portion of Route 6, which lies between Salem and Woodstown. **5 Miles**

**Somerset County, Route 9**—What is designated as Route No. 9 from Middlesex Borough to the easterly boundary line of Somerville, a distance of approximately 4.5 miles; also that portion of the State Highway System, Route No. 16, from the westerly end of the cement pavement at Douglas Avenue, Mine Brook, through the Borough of Fair Hills to Bedminster, thence to Somerville via Pluckamin to Route No. 9 at West End Avenue, Somerville, a distance of approximately 11.5 miles; also that portion of Route No. 9 from the corner of West End and Mountain avenues in the Borough of Somerville in a westerly direction to the North Branch River at North Branch a distance of approximately 4 miles; also that portion of Route No. 16, beginning at the corner of Main and Bridge Streets in the Borough of Somerville and extending in a southerly direction to the crossroads at Woods Tavern, a distance of approximately 4 miles. **22.3 Miles**

**Warren County Route 9**—(1) From the dividing line between the Town of Phillipsburg and the Township of Pohatcong and extending to the Hunterdon County line at Bloomsbury, being part of State Highway Route No. 9. (2) From the Musconetcong River, being the dividing line between Morris and Warren Counties at Mill Street, Hackettstown, N. J., and extending to the intersection of the road leading to Hope at Great Meadows, part Route No. 5. **12 Miles**

**Salem County, Route 6**—The unfinished portion of Route No. 6, which lies between Shirley and Oldman's Creek. 1923 reimbursement. **6.812 Miles**

**Cumberland County, Route 6**—That portion of Route 6 of the State Highway System beginning at the dividing line between the Township of Deerfield and the City of Bridgeton, and extending southerly, over what is commonly known and designated as North Pearl Street, a distance of approximately one-half mile to a point one thousand feet south of where the Central Railroad Company's tracks cross said North Pearl Street. 1922 reimbursement.

**Somerville, Routes 9 & 16**—That portion of Route No. 9, known as Main Street, and Route No. 16, known as Bridge Street. **0.8 Mile**

**Bridgeton, Routes 6 & 15**—That portion of Route 5 and Route 15 on East and West Commerce Street, Bridgeton. **2.4 Miles**

**Plainfield, Route 9**—The section of Route No. 9 of the State Highway in the City of Plainfield between Plainfield Avenue and the southwesterly city line. **2.5 Miles**

**Elizabeth, Route 1**—Rahway Avenue (Portion of State Highway Route No. 1) from the southerly city line of the City of Elizabeth to Cherry Street. **1.02 Miles**

We're here because  
We're here because  
We're here because  
We're HERE!

## Second Annual Convention of the New Jersey State Highway Association

Meetings Will Be Held Every Morning In  
The Assembly Room, Hotel Stacey-Trent, Trenton

The Banquet will be held at the Stacey-Trent Hotel in the Evening of the 10th,  
at 6.30 P. M.

Reservations for the Banquet should be sent at once to  
Mr. A. Lee Grover, Chairman Committee on Arrangements

A good feed and a big time—Plan Now to be there!

### Committee on Dinner

J. Bragg, Chairman  
Fishberg, Secretary  
Sullivan Martin  
Hall Wildblood

### Committee on Emblem

Moore, Chairman  
Fishberg, Secretary  
Johnson Tynan  
Shinn Woodruff

### SPECIAL NOTICE!

Contractors and Material Men are invited to attend at the same subscription price  
the Members of the Association

## "Dragon" Cement Measures Up Both Ways

"In selecting a cement", says John C. Trautwine, Jr., "a reputation gained by years of successful use and experiment is of greater value than the results of a few tests."

In June, 1921, thousands of barrels of Dragon Portland Cement were used in

the construction of concrete highways in New Jersey.

Every sample of Dragon Cement tested by the State Highway Department for this purpose was accepted. THERE WAS NOT A SINGLE REJECTION.

"For cement you can depend on—use Dragon"

IN USE SINCE 1889  
**Dragon**  
PORTLAND CEMENT

LAWRENCE CEMENT CO.

PHILADELPHIA

302 Broadway, NEW YORK



Above: Tank wagons spraying "Tarvia-X" under steam pressure with special Barrett nozzle.

Left: Brighton Plant, Rochester, N. Y., with loading chutes for tank cars and motor trucks. Right: Tarvia Service Station at Syracuse, N. Y., completely equipped to ship in tank cars, motor trucks or barrel lots.

## Service!

**C**ALL on our Special Service Department regarding your road problems or the conditions in your vicinity. We gladly put the skill and experience of our engineers at your disposal. This service is free for the asking. If you are interested in *better roads and lower taxes*, here is an organization that can be of real service to you.

### Tarvia—When you want it

In road work, building or repair, nothing is more important than having material on hand *when* it is wanted. Delays and holdups on delivery are expensive. Tarvia Service can be depended upon. Tarvia Service is always "on the job."

### Tarvia—Where you want it

Back of Tarvia Service stands the great Barrett organization with its branches, placed all over the U. S. These branches are strategically located to afford efficient centers of distribution. You can always get Tarvia *where* you want it.

### Tarvia—How you want it

Tarvia can be delivered by tank car, motor truck, tank wagon or in barrels. As a rule, Tarvia motor truck service is available within 40 miles of any Barrett Service Station or plant. When the size of the job warrants, motor trucks may be furnished at any distance from the plant or service station, the trucks operating from tank cars placed on sidings.

Motor truck distribution is faster and well worth the slight increase in price necessary to cover the use of the trucks, but equally good results may be obtained with the tank wagon—Barrett nozzle method—as shown in small illustration above.

Simply specify *how* you want Tarvia delivered—we'll do the rest.

# Tarvia

*For Road Construction  
Maintenance and Repair*

The *Barrett* Company  
Offices in  
NEW YORK, PHILADELPHIA, BOSTON  
and Other Principal Cities

**T**ARVIA is a coal tar preparation made in a number of grades to meet varying road conditions. It is the most popular road material in America and has solved the problem of low cost, traffic-proof roads and pavements for hundreds of towns throughout the country.

Booklets free on request



Lincoln Highway, Middlesex County, N. J. (Courtesy Portland Cement Association)

## "Here's the Bond but Where's the Road"

That's a famous question—but you never heard it asked about a road made with VULCANITE.

No Sir! Vulcanite roads *stay* right because Vulcanite Cement is made right.

Our plant at Vulcanite (Warren Co.) has a capacity of *two* million tons a year.

*"Let's get together and talk cement"*

**VULCANITE PORTLAND CEMENT CO.**

PHILADELPHIA

BOSTON

NEW YORK

## Why *you* should make a note of the fact that *we* are still making cement

Operations on road jobs have ceased. But our cement production *goes right on*. Twenty-four hours every day, our big plant at New Village, New Jersey, is still operating.

The reason is—

*That we may be in a position to make immediate shipment in any quantity, when YOU are rushed next season.*



**EDISON PORTLAND CEMENT CO.**

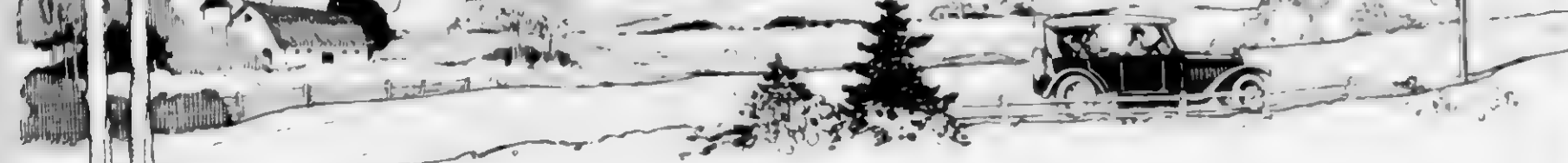
NEW YORK

BOSTON

PHILADELPHIA



## ALONG THE ROAD



**CORDUROY IKE**  
The Concrete (headed) Philosopher. He's been wanting his photo printed. We'll get around to everybody in time.

### "Color Signals" Another Big Aid to Motorists

As you know from your "ROAD TIPS" it is the purpose of the Highway Department to mark all roads in such a way that the traveler can tell at all times in just *what direction* he is going—north, south, east or west, or in between.

To accomplish this, poles along the important roads are being "banded" as rapidly as possible. The colors employed to indicate how the roads run are as follows:

- Blue—North and south.
- Red—East and west.
- Brown—Northeast and southwest.
- Yellow—Southeast and northwest.

Moreover, *two bands in succession* indicate a turn ahead.

The photograph below shows one of the new color-band signals; in this case a yellow band, indicating that the road runs northwest and southeast. The narrow white borders at top and bottom are employed to make the signal more readily seen.



### Where Accidents Occur

Every auto driver in this state should read carefully the report of road accidents made by the Maryland State Roads Commission.

"Most highway accidents occur on long stretches of road instead of at the curves, and are due to reckless driving", says the report.

Keep that in mind the next time you are tempted to "step on the gas" beyond the safety limit, by a long stretch of good road.



**NOTE THE COLOR BANDS!**  
In this case its yellow, indicating that the road runs diagonally N. E. and S. W. (White Horse Pike, Absecon-Egg Harbor)

### Concrete Philosophy

BY  
CORDUROY IKE

If there was a law to distribute cars according to size of families, a lot of folks with Fords would be riding in Packards; and *vice versa*.

To judge by the results of experience so far, it seems to be about as easy to invent a "chemical substitute for gasoline" as it is to invent a chemical substitute for razors. The hair keeps on growing, and the gasoline burning.

A lot of the guys who objected to the "extravagance" of building a bridge across the Delaware have already begun to mark up their properties.

Now that Chief Tom Wasser has got the whole darn Highway Department organized, down to the last shovel, for a record-breaking snow removal stunt—it looks like there isn't gonna be no snow. Ain't Nature mean?

It's not the *mileage* that takes the life out of your car, it's the churning, churning, churning, on the soft dirt roads.

### A New One on the Cop

When a lady who was "burning up the road" on the boulevard was overtaken by a traffic officer and motioned to stop, she indignantly said:

"What do you want with me?"

"You were running forty miles an hour," answered the officer.

"Forty miles an hour? Why, officer, I haven't been out an hour," said the lady.

"Go ahead," said the officer. "That is a new one on me."

# The Highwayman



Snow Plows Clearing Detour near Asbury, January 21, 1922

### The Highwayman Is Out For More and Better Roads in New Jersey



Road at Budd Lake  
This road parallels the lake, and was built by inmate labor under the direction of State Labor Division

### Where Do You Stand on Your Highways?

Say, now that we've been giving the highway workers, from the Highway Commission to the pick and shovel men, the "once-over", for the past few issues, lets turn the limelight on the auto-owners.

Let's speak right out in meeting.

First of all, how many of us guys who use the highways ever give one serious thought to the whole problem of highway policy—construction, maintenance and—financing?

Haven't we just got into the habit of taking our roads for granted? And felt we were doing our part if we cussed the Highway Department ever time we had to detour?

Read what Highway Officials of the country, at their last Annual Convention, had to say regarding our attitude. You'll find it in the last six paragraphs on page 8.

Motor-owners, this is your problem, no less than that of those who are building and keeping the roads you use.

Don't try to pass the buck—you, every one of you, must give this problem your personal attention.

### Wherever Found They Meant You, You Highwayman.

"Resolved; that this organization pledges itself to work for—the reward of ability wherever found."

Boys, when the American Association of Highway Officials passed that resolution, they had you

fellows in mind.

And they meant what they said.

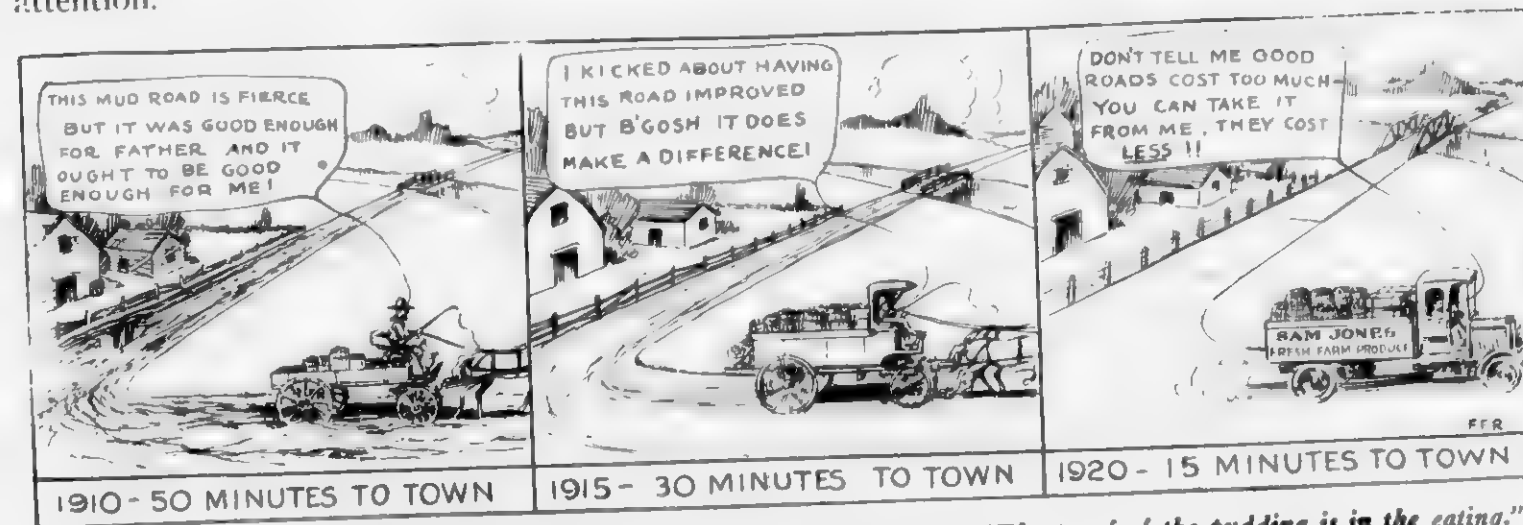
Don't get the damfool idea that, just because you may not happen to be "up near the top", your work isn't noticed. That it makes little difference whether you just "get by", or really do your best and utmost.

It does make a difference. It makes a difference with your work—but it makes a bigger difference with *you*.

If you don't think you are where you ought to be, remember that the surest way to dig yourself out, and up, is to dig in like the devil.

Hoping you are same!

*The Highwayman*



The Evolution of a Hard-Shelled Hick—illustrating the old saying that "The proof of the pudding is in the eating."

# The Highwayman

## The Highwayman

Published Monthly By The  
State Highway Department, at Trenton, N. J.

The HIGHWAYMAN will be sent free upon application  
to any citizen of New Jersey who is interested in  
More and Better Roads for New Jersey.

### THE HIGHWAYMAN

H. C. S. Editor in Chief

Associate Editors

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C. F. Bidwell Edward E. Reid  
Chas. Fishberg

Managing Editor

J. F. Rockwell

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George Padrick	Newark
Walter F. Whittemore	Newton
Thomas F. Collins	Elizabeth
Alfred S. L. Doughty	Mt. Holly
Chas. F. Seabrook	Bridgeton

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4th Vice President	G. R. Moore, Right of Way
5th Vice President	Wm. J. McGovern, State Labor
6th Vice President	H. D. Robbins, Construction
Executive Secretary	EDWARD W. O'EDEN

## A Deep Problem Which Deeply Concerns You

On another page of this issue (page 8) you will find some food for thought.

Read that page through from the first line to the last.

We are calling your attention to it here, because, as a general thing, a bunch of "resolutions" makes dry reading.

Not so in this case. With every fifth family in the United States owning a car, and the number constantly increasing, the problem of our national and state highways has, within a decade, assumed a position of importance which could never have been prophesied for it. It is, without exception, the greatest civic problem of the hour.

What is your policy in connection with this great national problem?

"Haven't one"—you say—"Fact is, I've never given the matter much thought."

Well, the time has come when we all must give this problem some thought.

Read every line of those resolutions passed at the Omaha meeting of the American Association of State Highway Officials.

Then you'll know something about our National Highway problem, and how it concerns you.



**A. Lee Grover**  
Chief Clerk of the Department

You know Grover—smiling A. Lee.

Mr. Grover is no stranger to Trenton. He was born at Hutchinson's Mill in Mercer County—which of course is not far from the Capitol. This important event happened so recently as '89.

A. Lee passed on his smiling way (breaking many hearts as he went, we must suppose) through the county schools, and then attended the Rider Moore and Stewart School of Business in Trenton, from which he graduated in 1907.

In 1911 Mr. Grover engaged in the electrical contracting business until 1914, when he accepted a position with the Department of Public Roads under Colonel F. A. Stevens, State Road Commissioner.

On the reorganization of the State Highway Department under the direction of General Goethals, as provided under the "Edge Roads Act" of 1917, he was appointed Chief Clerk of the Department and Secretary of the State Highway Commission.

Deliver To



**T. J. Wasner, State Highway Engr.**  
Broad St. Bank Bldg.  
TRENTON,  
N. J.

The above is the way the Atlantic County Engineer, Mr. Alex. Howard Nelson, addresses the State Highway Engineer.

## It's All Right, Chet—; Suppose You'd Been 20 Miles From a Garage?

They tell a good one on Chester Burn as follows: Chet was not accustomed to the peculiarities of an Essex car and the other day when he was going out over some work in the Northern Division, he stopped his car and when he went to start up again, he was unable to shift the gears.

He looked all over the darn thing in order to ascertain what the trouble was and finally gave it up and had someone haul him to the nearest garage about five miles, where the garage man took the key from the ignition lock and unlocked the gear-shift.

Chet says there is no use in having two locks anyway."

# of New Jersey



**Chas. F. Seabrook**  
One of New Jersey's Highway Commissioners and  
Master Farmer of the United States

"C. F." was born "down on the farm," near Bridgeton in Cumberland County, New Jersey.

But in those days it wasn't the farm, just "a" farm; one you would never have noticed from thousands of others in the State.

Today "Seabrook Farm" is known not only throughout the State, but all over the world. Two railroads have extended their tracks, for miles, into the "farm yard" to get its business. Upwards of 3000 carloads of produce, all grown on the farms, is shipped yearly.

So you can see why Gov. Edwards, who was looking for "men who could do things," and who wanted the farmers of the State to be represented on the New Highway Commission, picked a real dirt farmer.

### NEW JERSEY STATE HIGHWAY DEPARTMENT

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EDWARD E. REID, Secretary

CHAS. FISHBERG, Assistant Chief Clerk

MISS GRACE WILLIAMSON, Chief File Clerk

R. W. WILDBLOOD, Purchase Clerk

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M. J. HENNING, Chief Clerk

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G. R. MOORE, Left Construction Engineer

R. A. MEYER, Right of Way Engineer

C. A. MEAD, Bridge Engineer

THOMAS GAMES, Acting Supt. of State Labor

C. A. BURN, Construction Engineer

H. D. ROBBINS, Central Division Engineer

E. A. WILLIAMS, Southern Division Engineer

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N. C. APPELGATE, Superintendent of Equipment

A. D. BULLOCK, Projects Engineer

H. C. SHINN, Engineer of Special Assignments

TESTING LABORATORY

R. B. GAGE, Chemical Engineer

J. G. BRAGG, Senior Testing Engineer

F. H. BAUMANN, Senior Testing Chemist

Famous Sayings

of Infamous Highwaymen

CHARLES HURLEY: "The report were lit."

T. J. GEORGE: "I'll see the boss about that tonight."

C. A. BURN: "A-L-L-I, right" (or) "Where's my pipe?"

Wm. F. McGOVERN: "It's a lot of money, but he's a good man."

JOHN L. VOGEL: "Now keep this under your hat."

D. W. KREITWITZ: "When I laid out the Sunnyside Yards" (or) "She's my cousin."

CLOSSON: "No—it won't do."

CHAS. WILMOTT: "When I worked with the Public Service."

APPELGATE: "There are only two things that can happen to a pump."

G. W.: (In distress at the Highway Party). "Oh! I forgot the little hairpins in my head."

MISS LAUGHRY: "They haven't any Angel cake, but I can get some good chocolate layer cake with nuts all around."

J. NEWMARK: "Well, where is he then?"

R. J. DEANEY: "Your records are wrong."

E. R. SHERRAUM: "Well, why don't you say what you mean?"

T. E. OLSEN: "As a matter of fact—"

A. J. LICHTENBERG: "It can't be built for that—The material costs that much."

H. D. ROBBINS: "Well,—I'll tell you."

COMM. DOUGHTY: "Well,— as the fellow said."

Maintenance of improved roads has often been neglected.

As a result, costly improvements have gone to ruin.

Insufficient funds for maintenance have been largely to blame.

No financial oversight can be more disastrous than failure to provide for our improved highways.

The character and volume of traffic determine the type of road to build, provided adequate maintenance is assured.

Economy, therefore, can be had only when proper maintenance is guaranteed.

No part of highway work requires more skillful supervision than maintenance.

A slipshod method of maintenance will ruin the best of roads.

Nowhere is there a greater field for application of sound business principles than in public highway maintenance.

Constant attention to details, combined with close study, produce efficiency.

Efficient maintenance—the secret of public highway success.

Oakland, Mich., County Highways.

The small mistakes are the tall mistakes.

(Stenographers take note)

"These small jobs will only take up a couple of days of Mr. Applegate's hard (yard) forces when conditions are favorable."



# The Highwayman

## Highway Contractors' Column

The Highway Contractors' Association of New Jersey was represented at the National Good Roads Convention at Chicago, Ill., from January 16th to January 20th, inclusive, by about half of its membership. One can readily see from this the interest and enthusiasm which the contractors of this Association are putting into their business. They attended the Convention in order to get new ideas on road equipment and (new) handling of materials in order to expedite their work and perform better work for the State, Counties and Municipalities, thereby saving the public considerable money and a great amount of inconvenience.

They returned to dear old Jersey with many new ideas pertaining to the highway business and will endeavor to put them into practice this year. SO, LET'S GO!

The following is a list of the members of the Highway Contractors' Association of New Jersey, and we feel certain after you have perused the names of the various contractors and firms of this list you can see that the Association is composed of reputable and responsible contractors that are doing their utmost to put the contracting business on the high plane on which it should be: LOOK THESE OVER, FOLKS!!!

James J. Barrett, Trenton, N. J.  
 Jos. F. Burke, Plainfield, N. J.  
 Cassidy & Homan, 618 Washington St., Cape May City, N. J.  
 Everton Corson, Ocean City, N. J.  
 Wm. Penn Corson, 1141 Sycamore St., Camden, N. J.  
 Antonio DeLucia, 52 Bayard St., Trenton, N. J.  
 M. Irving Demarest, Sewaren, N. J.  
 Carroll H. Earl, McFadden Bldg., Hackensack, N. J.  
 Earl-Lansdell Co., 271 James St., Hackensack, N. J.  
 East Jersey Bridge Co., Perth Amboy, N. J.  
 Wm. Eisenberg, Woodbine, N. J.  
 Franklin Contracting Co., 20-32 Washington Place, Newark, N. J.  
 J. B. Gilligan-Casey Co., 919 Broad St., Newark, N. J.  
 John W. Heller, P. O. Bldg., South Orange, N. J.  
 E. C. Humphrey, Hackensack, N. J.  
 O. G. Julian Eng. & Cont. Co., No. 1 Exchange Place, Jersey City, N. J.  
 Chas. T. Kavanagh, 32nd & Prospect St., Bayonne City, N. J.  
 John M. Kelley Cont. Co., Federal St., Camden, N. J.  
 Liddle & Pfeiffer, Perth Amboy, N. J.  
 McDermitt Inc., 141 S. 8th St., Newark, N. J.  
 Wm. P. McDonald Const. Co., 17 W. 42nd St., New York City.  
 Miles-Tighe Const. Co., 610 Drake Bldg., Easton, Pa.  
 E. Riley Mixer Co., Goshen, N. J.  
 Nesto Construction Co., 64 State St., Newark, N. J.  
 New Jersey Const. Co., Hackensack, N. J.  
 Newark Paving Co., 133 First St., Newark, N. J.  
 Northern Const. Co., 423 Amherst St., East Orange, N. J.  
 The Osborn & Marcellis Co., Upper Montclair, N. J.  
 Rees-Taylor Inc., American Mechanic Bldg., Trenton, N. J.  
 T. H. Riddle, New Brunswick, N. J.  
 Richards & Gaston Inc., 110 S. Bridge St., Somerville, N. J.  
 Ross & Whelan Inc., Broad St. Bank Bldg., Trenton, N. J.  
 Salmon Bros., Netcong, N. J.  
 Ralph Sangiovanni, Bordentown, N. J.  
 Sampson & Reuter, 221 Catherine St., Elizabeth, N. J.  
 H. N. Scott, Cranbury, N. J.  
 Conrad Scholt, 16-18 Richmond St., New Brunswick, N. J.  
 L. J. Sieling, Second National Bank Bldg., Red Bank, N. J.  
 Sigafos & Poore, Riegelsville, Pa.  
 Standard Bithulithic Co., 50 Church St., New York City  
 Michael Staub, Swedesboro.



More of the State Labor forces' good work—cut at top of Jugtown Mountain. (Route No. 9; Section 1)

Thompson & Glickman, Freehold, N. J.  
 Wm. Turkington, 211 Highland Ave., Trenton, N. J.  
 Tri State Construction Co., 26 S. Laurel St., Bridgeton, N. J.  
 Union Paving Company, 30th & Locust Sts., Philadelphia, Pa.  
 Utilities Construction Co., 5 Spring St., New Brunswick, N. J.  
 Graham VanKeuren, 76 Montgomery St., Jersey City, N. J.  
 Philip Jannarone, 20 Harrison St., Nutley, N. J.

## A Little Of This and That MISTAKES

JOHN M. KELLEY, (Contributed)

When the plumber makes a mistake he charges twice for it.

When a lawyer makes a mistake it is just what he wanted, because he has a chance to try the case all over again.

When a carpenter makes a mistake it's just what he expected.

When a doctor makes a mistake he buries it.

When a judge makes a mistake it becomes the law of the land.

When a preacher makes a mistake nobody knows the difference.

But when a contractor makes a mistake—Good night! he pays dearly for it.

EVERETT CORSON: "If a contractor would say all the mean things a woman can say, you would hear some high class cussing."

CARROLL H. EARL: "Kid McCoy's eighth wife is seeking a divorce. This recalls an old saying: 'I love my wife, but oh you kid.'"

AN APOLIAN FROM CHICAGO: "Colonel, shall I brush you off, sir?" asked the porter. "No," replied Fred. Schneider, "I shall get off in the usual way."

WM. PENN CORSON: "Now the killjoys want to eliminate tobacco from the tournament. Why not pass a general law making all happy persons criminals, and be done with it?"

O. G. JULIAN: "You can't choose your own name, but you can select your own teeth."

A. B. WHELAN: "A friend of mine remarked that the fellow with a full cellar has a lot of boozed friends."

T. H. RIDDLE: "A swinging door of a business man's office says: 'Push', and the swinging door of the City Hall says: 'Pull.'"

PETER STAUB: "Swedesboro is a fine place, but oh you Chicago!"

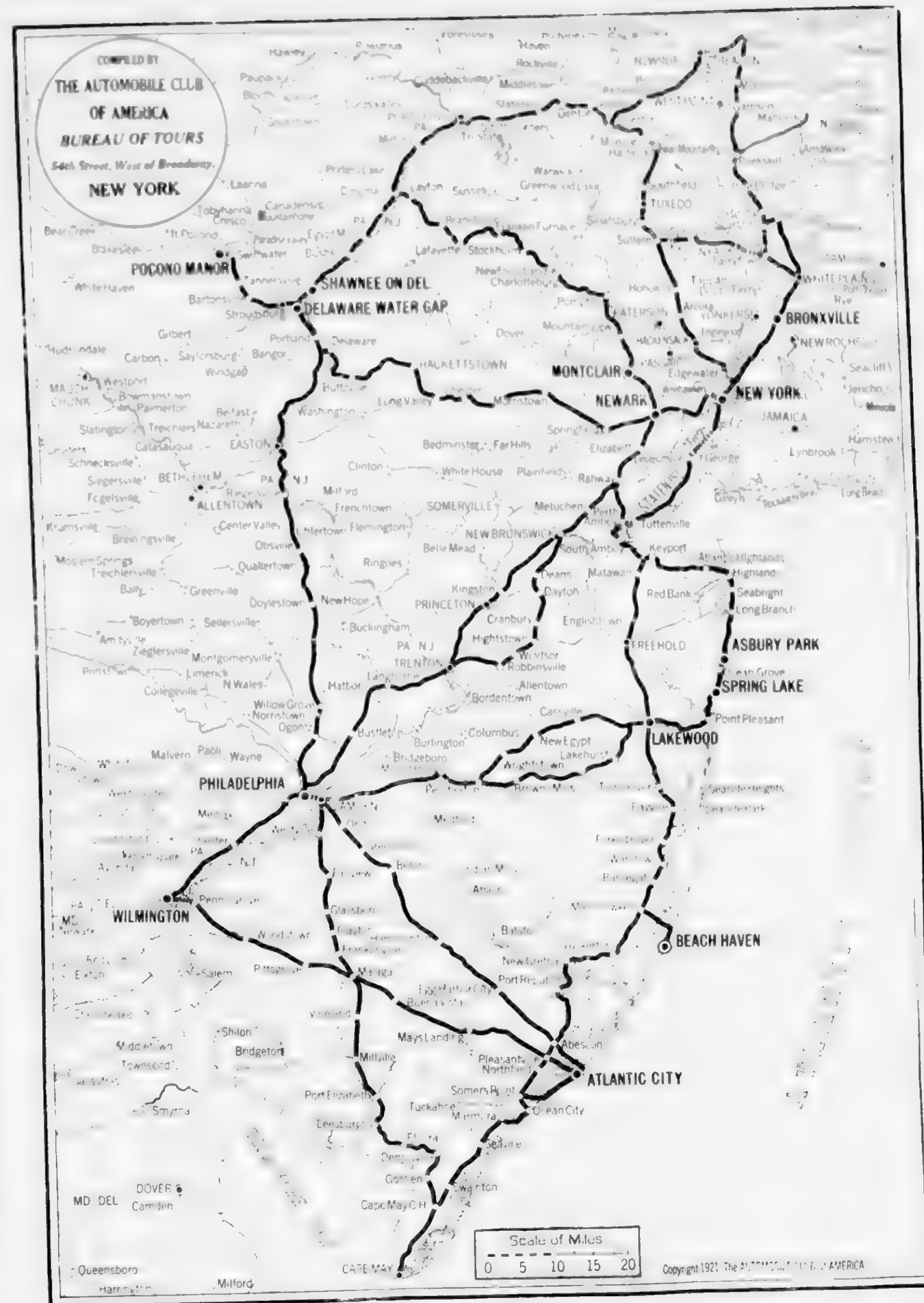
RALPH SANGIOVANNI: "Al, no more Chicago for me!"

JOE BURKE: "There may be no royal road to learning, but the chief trouble with the system that is being complicated by the educational faddists is that they are making too many detours."

## News Item

The terrific snow storm of January 28th, 29th and 30th demonstrated better than anything else could the greater practicability of the New Jersey busses when confronted by unusual conditions. In many places they kept right on ploughing through when the trolley cars gasped and gave up.

Mr. Editor, give credit to Mr. Thomas J. Wasser, State Highway Department, and Highway Contractors Association of New Jersey for their cooperation in keeping the highways free from snow, in order that busses and other traffic would not be halted in their movements.



Reproduced by courtesy of the Automobile Club of America.

# Road Tips

## MONTHLY BULLETIN OF DETOURS

Adopted by the New Jersey State Highway Commission  
Corrected to February 1, 1922

All detours posted with signs and blazed with "Arrows"

(Color signals to right will be used along all State roads as soon as possible.)

**ROUTE NO. 1—Rahway-Elizabeth: Union County**  
Detour through Rahway will not be used after December 15th, when Route No. 1 will be open to Chestnut Street, Roselle. Thence over Chestnut Street to Route No. 9 at Roselle Park and thence over Route No. 9 to Elizabeth.

**ROUTE NO. 4—Red Bank-Eatontown: Monmouth County**  
Road open to traffic.

**ROUTE NO. 4—Absecon-Smithville: Atlantic County.**  
Road open to traffic.

**ROUTE NO. 5—Budd Lake to Hackettstown: Morris County**  
Not necessary to detour. New construction is completed along line of the old road. Present construction being along new right of way.  
Local roads are in bad condition.

**ROUTE NO. 6—Mullica Hill-Bridgeton: Gloucester, Salem, Cumberland Counties**  
Detour has been abandoned and road opened to all traffic.

**ROUTE NO. 6—Woodstown-Salem: Salem County**  
Road open to traffic.

**ROUTE NO. 8—Sussex-Unionville: Sussex County**  
Not necessary to detour, as the present road will be kept open and maintained for traffic during construction.

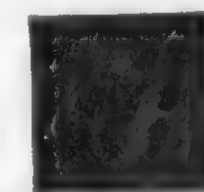
**ROUTE NO. 9—Perryville to West Portal: Hunterdon County**  
Via Clinton, Glen Gardner, Hampton, Asbury, West Portal.

**ROUTE NO. 10—Arcadian Way to Fort Lee Ferry: Bergen County**  
Not necessary to detour as entire construction is over new right of way.

**ROUTE NO. 12—Denville-Parappany-Pine Brook: Morris County**  
Denville, Tabor, Morris Plains, Morristown, Whippany, Hanover, Livingston, Roseland, Essex Falls, Caldwell and Pine Brook.

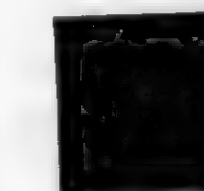
**ROUTE NO. 12—Phillipsburg to Port Colden: Warren County**  
Via Phillipsburg, Bloomsbury, West Portal, Asbury, Washington and Port Colden.

This color blue on posts or signs indicates that road is running North and South



Red shows that it lies East and West

White-yellow tells you that it takes a diagonal course south-east or north-west



And brown indicates that it takes a diagonal course north-east or south-west



### For You— "The Highwayman"

Do you use roads? Do you want to know where they are being built, and what detours to take, each month?

Then send, TODAY, to

**The Highwayman**  
New Jersey State Highway Department  
Trenton, N. J.

Just ask to be put on The Highwayman's list. A postal will do.

### Turn Over!

On the Back You'll Find the Map.

## of New Jersey



**G. Roland Moore**  
Assistant Construction Engineer

### My Job

Sent in by G. R. Moore

It isn't as big as the other chap's  
With the flaming sign,  
It isn't as marked as your own, perhaps,  
But it's mine.  
Just my own little job to hold down tight,  
Lieve to and stand to  
With man's strength and might.

It doesn't go down to the golden ways,  
Sun kissed and alight,  
It isn't all laughter and cloudless days,  
But it's mine, all right,  
My own little job that I have to do,  
Lincerely, faithfully, fearlessly, too.

—Bunce-Kinder Company in  
Telephone Review, N. Y.

### Introducing Mr. G. R. Moore

Boys, meet the Assistant Construction Engineer.  
Mr. Moore is a graduate of the Rensselaer Polytechnic Institute.

For a year after leaving Rensselaer, he was instructor of Civil Engineering.

Civil Engineering degree was received from the Rensselaer Polytechnic Institute in 1909, followed by one year appointments as Instructor of Civil Engineering at the University of Pennsylvania in 1910.

In 1910 was engaged with the Pennsylvania Railroad Company, Engineering Forces, on heavy railroad construction, following which, one year was spent in private practice of Municipal Engineering and a short period in bridge designing and construction, with Mercer County, New Jersey.

After that he was appointed Assistant Professor of Civil Engineering at the University of Cincinnati, Ohio, and engaged there in Construction, Research and General Engineering work for a period of four years.

In 1917 Mr. Moore entered the employ of New Jersey State Highway Department as Chief of Party, and successfully held the following positions up to the present time: Chief of Party, Resident Engineer, Asst. Division Engineer, Asst. Right of Way Engineer, Asst. Construction Engineer.



A scene at the Budd Lake job where the State Labor forces were employed

### Differentials on Cement Orders Prohibited

An Open Letter to the Highway Commission

...the condition of the roads in this State is such that it has become imperative that the State Highway Commission should take steps to secure the lowest possible cost of public construction. As a result of this condition, steps were taken to secure the lowest possible cost of public construction. The Commission of this State, on the 11th day of December, 1921, in re R. G. Marriott vs. Oklahoma Portland Cement Company, a Corporation, etc., et al.

It is therefore the Order of the Commission that the respondent companies, the Oklahoma Portland Cement Company, etc., etc., and the Dewey Portland Cement Company, etc., etc., be ordered to desist from the practice of refusing to supply Portland Cement to the State of Oklahoma, the counties thereof and the municipal subdivisions of the State of Oklahoma, for use in construction of public works, except upon condition that the local distributing agencies be allowed to exact a commission for such sales; and that said respondents are ordered to render their services and to furnish their commodity upon reasonable terms, without discrimination, in carload lots direct from the factory to any such municipality or its contractor for the use in the construction of any public work undertaken by the State, county or municipality thereof.

A similar order was entered by the Corporation Commission applying to purchases by individuals.

The above orders were entered after a full hearing, based on the complaint arising out of the present marketing methods adopted by the members of the Portland Cement Association.

At this hearing, all parties in interest were present in person and by counsel.

You will understand, of course, that this differential bears no relation whatever to the selling efforts of the retailer, these efforts being entirely non-existent, as the sales are almost invariably made by the selling organization of the particular manufacturer of this product.

It was in order to procure for the construction interest and thereby to the benefit of the public, a wholesale market for bulk materials that this order was sought. The result of the entering of this order has had a demoralizing effect on the sales organization of the two defendant companies and should the order be sustained by the Supreme Court, an entire reorganization of the selling methods of the manufacturers of cement throughout the country will be called for.

It was suggested to me the other day by a gentleman representing these interests, that if an order to the same effect could be entered in all of the States, so that it became nation wide, the cement interests would not be sorry to see this done, and that in most cases they would prefer to deal with the contractor direct.

I am, therefore, addressing a letter to the Highway Commission of each State in the Union, asking them if they would not co-operate with us to the extent of putting into operation such machinery as their laws provide, which shall produce this much-to-be-desired result.

If there is any further information which you may desire, this office will be glad to furnish the same wherever possible.

R. G. MARRIOTT, Secretary.



# The Highwayman of New Jersey

7



Contractor Earle realizes the importance of "morale" in his forces, hence the comfortable quarters.

## The Men Who Make the Roads

O, Brothers, when you motor out  
In double hours or fivers,  
To lamp the landscape round about  
And agitate your livers,  
The while your gas-consumer flies,  
O'er beaten trails and by-ways  
O, breathe a prayer and bless the guys  
That built the bloomin' highways.

Be mindful of their lowly lot,  
They rarely ride as you do,  
You drive nice cars, but they do not,  
At least a very few do.  
And life would be a dreary hike,  
If it were not for the fellows like  
The dinks who build the highways!

C. WILKS HALLOCK.

## Three Men's Conception of the Work They Were Doing

A man once saw three men chipping away at a block of stone. He asked the first man he came to what he was doing. He replied that he was making \$7.00 a day.

He asked the second man what he was doing. He said he was chipping off the stone.

He asked the third man what he was doing. He replied that he was building a cathedral.

It will be seen that only one of these men had the proper conception of the importance of his work. This might be applied to roads and if any man employed shoveling stone into a wheelbarrow to feed a concrete mixer was asked what he was doing, he might properly say that he was building a highway instead of simply making so many dollars per day or shoveling stone into a wheelbarrow.

## Construction of the Road from Absecon to Smithville, Route No. 4 of the New Jersey State Highway System

By R. D. JACO

Bids for this work were received on June 28th, 1934, but the contract was not delivered until August 20th, and work was not started on that date. The road is a Warrenton surface with a 6 in. concrete base with 4 foot gravel shoulders on each side. The length of the road from Absecon to Smithville is 10.5 miles. The placing of concrete was commenced on August 2nd and completed at 10 o'clock of Thanksgiving Day, November 24th. The total yardage was 70,132 square yards. This same yardage of concrete was covered with a Warrenton Bithulithic pavement and the work of laying this pavement was completed about 1 month after the completion of the concrete base. There was approximately 20,000 square yards of excavation from the whole road and about 30,000 square yards of gravel shoulders and about 3,000 square yards of concrete gutter.

For the purpose of unloading the material from the cars there was a plant established on the White Horse Pike about 1 mile from the junction of Route No. 4 with the White Horse Pike, and all materials were hauled over that road. The contractor, C. H. Earle, of Hackensack, New Jersey, had a siding at his unloading plant and unloaded his material with a 20-ton Holt crane. Storage piles of pebbles and sand were created on either side of the bin which shows in the picture, and all material was passed through this bin, one side of the bin being for sand and the other side for stone.

Underneath the bin was placed 4 steel hoppers, 2 for sand and 2 for stone. The hoppers were made to contain just the required amount of each material, the stone hoppers containing 17 1/2 cubic feet of stone and the sand hoppers containing 10 cubic feet of sand. The trucks used for conveying this material to the mixer on the road were Autocars with a center board so that each truck carried 2 batches of dry material.

On entering the yard at the plant these trucks were backed under the hoppers, received their load of sand and stone and then were run to the back of the yard where 3 1/2 bags of cement

were added. The cement was delivered to the truck either from an unloading platform at the rear of the bin or from a platform at the front of the bin. A 10-ton Holt tractor was used to move the trucks from the platform to the platform. After leaving the unloading platform the trucks were immediately out on the road to the mixer.

On entering at the mixer the trucks were immediately backed up to the skip and each was dumped separately directly into the skip of the mixer. The truck then returned to the plant for another load. The mixer used on the work was a Foote mixer and was so operated that there was no delay in the mixing of the material while the skip was being loaded.

For the purpose of conveying this concrete mix 12 Autocars were used on this work and they travelled back and forth at about a 4 minute headway. These trucks were housed in a Blawknex steel building 50 ft. x 30 ft. Reference to the picture will find this garage at about the center of the plant. To the south of it are buildings for housing some of the men and a Blawknex 15 ft. x 20 ft. office building. All of these buildings are erected so that they may be taken down and erected at any other site.

This plant has its own gasoline tank from which gasoline for the trucks and equipment are supplied. A driven well supplied water to the entire plant and equipment.

The heavy grading was done with an Erie shovel and the light grading was done with a 10-ton Holt tractor pulling an Adam's grader and a small Cleveland tractor pulling a Fresno scraper. The photograph shows a 5-ton Holt tractor, but this was afterwards exchanged for a 10-ton, and while the 5-ton tractor was in use at the time the picture was taken the 10-ton tractor did most of the work of this nature. There were 2 rollers used on the work, both 10-ton rollers of the Buffalo-Pitts type.

At different points along the line of the road wells were



The cement was handled directly from the freight cars into the bin to which delivered the batches to the power.

driven to obtain water for the use of the concrete mixer and other pieces of machinery and for sprinkling the sub-grade before the concrete was laid and for sprinkling the concrete base during the curing period. To furnish the supply of water necessary for this work 15,000 feet of 4 in. pipe with the necessary fittings was used.

It is interesting to note that the daily reports show that there were only 14 bags of cement used on this work in excess of the theoretical requirement.

The asphalt surface of the type known as Warrenton Bithulithic was laid behind the concrete commencing about a month after the concrete was first laid and progressed so that all of the concrete base had from 2 to 3 weeks to cure before the top was placed.

The estimated cost of this work was \$395,557.00 and the actual total cost was \$395,557.00.

## An Error: They Were Four-Wheelers

The December issue of THE HIGHWAYMAN on Page No. 6, lower right hand corner, contained a photograph of a Four Wheel truck with snow plow attached. Our snow equipment includes four wheel drive trucks manufactured by the Four Wheel Drive Auto Company, and four wheel drive trucks manufactured by the Nash Company.

The title of the picture states that the truck in question is a Nash-Quad, when as a matter of fact the lettering on the front shows that it is manufactured by the Four Wheel Drive Company.

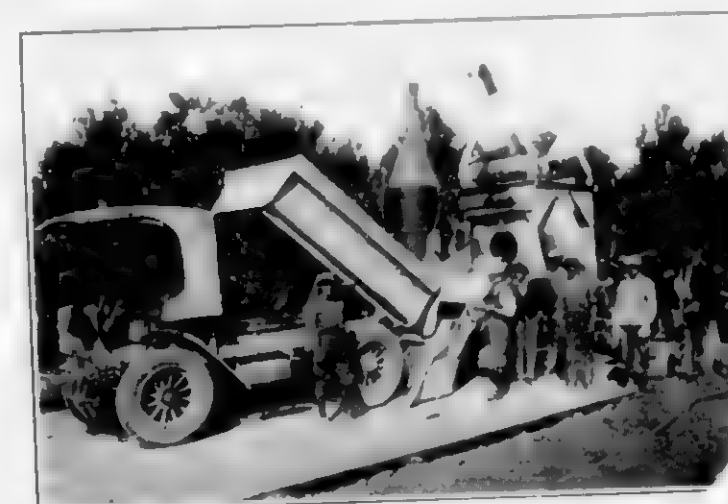
## Some Speed, Kid!

While we were waiting in the Construction Office of the Fernwood Service Station for the Superintendent of Equipment to return and transport us back to the Trenton Office, a noise was heard and without looking one of the men said:

"Here comes an aeroplane or Norm. Applegate."  
It was Norm.



A steam-shovel was used to fill the big dumping bin, from which the trucks were loaded automatically.



Dumping a "batch" of dry materials into the "skip" of the Foote power.



If this isn't a trim little road building outfit, then we never saw one. The man who said contracting couldn't be made a BUSINESS never lamped this lay-out of C. H. Earle's of Hackensack, N. J.

## Highway Comment in Review and Outlook

### Resolutions Passed At Annual Meeting of State Highway Officials

During the week of December 2, those most interested in highway development focused their attention on the meeting of the American Association of State Highway Officials which was held at Omaha, Neb. That much forethought had been given the plans submitted is shown in the resolutions which were passed and which we are convinced will receive the endorsement of all who have the development of our country and betterment of civilization at heart. Following are some of the resolutions.

**BE IT RESOLVED:** That the American Association of State Highway Officials welcomes the establishment by the National Research Council of the Advisory Board in this much needed effort to stimulate and co-ordinate highway research.

We wish to extend to the State of Illinois and to the Federal Bureau of Roads, our appreciation of their experiments and enlightening reports on highway design. We hope there will be available before our next annual meeting a comprehensive report of the results of the noteworthy experiment at Pittsburg, Cal.

**WHEREAS,** Advertising signs upon, along and adjacent to public highways serve no good purpose but, on the contrary, are a public nuisance in that they destroy the beauty of our landscapes, impair vision in dangerous places, and add to the difficulty of properly guiding and warning traffic.

**BE IT, THEREFORE, RESOLVED:** That this Association pledges its support to any proper movement to eliminate such advertising signs and urges upon its individual members the importance of aiding and encouraging legislation in all states to effect said elimination, to the end that our highways may be fully and safely occupied and enjoyed by the public for the use of whom they are acquired and built.

**WHEREAS,** Grade crossings of railroads and interurban lines with our highways constitute a grave menace to human life and property, and

**WHEREAS,** The increasing travel on our highways is each year making the danger greater and the list of dead and injured longer,

**BE IT, THEREFORE, RESOLVED:** That this Association pledges itself collectively and as individuals to use its best efforts to speed up the properly planned elimination of grade crossings to the end that all of them, especially on the main travelled highways, shall be eliminated as rapidly as funds can be made available by the public and the railway companies.

**BE IT FURTHER RESOLVED:** That we condemn, as against public policy, the present attitude of negation adopted by too many railroad companies and by too many state railroad commissions, because said attitude has resulted in the slackening of elimination work at a time when the protection of the traveling public is more urgent than ever before.

**BE IT RESOLVED:** That the American Association of State Highway Officials heartily endorse the action of Congress in adopting a policy of Federal Aid for highways, to be applied to a definite system of highways as provided in the Federal Highway Act, which went into effect November 9, 1921.

As officials of the State Highway Departments upon whom this law imposes certain requirements and obligations, we pledge our hearty and unqualified support to the Federal Bureau of Public Roads in carrying out the provisions of said Act.

Inasmuch as the Act contemplates continued Federal participation with the states in highway improvement, we realize and emphasize the absolute necessity of a definite policy projected far enough into the future to make possible the economic and satisfactory planning and carrying out of the intent and purposes of the Act.

To this end we endorse H. R. 8978 introduced by Hon. Roy Woodruff, which bill authorizes the appropriation of \$100,000,000 annually for five years beginning July 1, 1922, as a general Federal Aid appropriation, and we also urge that adequate provision be made in said bill for the continued development of highways in and adjacent to the

most important Federal Roadways, and that the Federal Government should not be required to pay more than its fair share of the cost of keeping in good condition our road transportation.

**WHEREAS,** The highway work of the States and the Federal Government should not be required to pay more than its fair share of the cost of keeping in good condition our road transportation.

**BE IT THEREFORE RESOLVED:** That the American Association of State Highway Officials urges upon the Interstate Commerce Commission and upon the various State Railroad Commissions (or equivalent state bodies) the importance of a review and comparison of the present rates on road materials and on other commodities, to the end that the present existing inequalities may be removed and the taxpayers' interests protected.

**WHEREAS,** By far the greater portion of the cost of modern highway construction and maintenance is due to the necessity of adequately providing for the movement of persons and goods by motor vehicles, and

**WHEREAS,** The taxes imposed upon real and personal property have, in many states, reached almost the maximum possible to be borne under present economic conditions, and

**WHEREAS,** The principal users of our highways, the operators of motor vehicles, can be justly charged an adequate amount for benefits derived and savings secured from and by our program of highway construction and maintenance, and

**WHEREAS,** in most of our states the owners of motor vehicles are paying an insufficient portion of the cost of the state's highway program, as compared to the portion of the cost raised by taxation on general property, despite the fact that the individual owner is always willing to pay his fair share of the cost.

**NOW, THEREFORE, BE IT RESOLVED:** By the American Association of State Highway Officials that we urge upon all states the fairness and the necessity of collecting an adequate portion of the cost of highway programs from the users of motor vehicles. This fair share is not only the cost of maintenance of modern highways, but includes also a fair proportion of the cost of new construction, because much of this latter cost is due to the necessity of adequately providing for motor traffic.

**BE IT FURTHER RESOLVED:** that we recommend appeals to the individual motorist for his support of this policy of providing for a fair distribution of the cost of highway improvement, because we believe that when he is made to realize that only in this way can a continuance of the required highway program be guaranteed to him, he will, being a fair minded American citizen, readily respond to such appeals.

**WHEREAS,** The American people have embarked upon a program of highway improvement involving the expenditure of many billions of dollars in the next decade, and

**WHEREAS,** the effective expenditure of these billions of dollars, and the proper carrying out of these programs depends upon the ability and efficiency of the Federal and State Highway Departments, and

**WHEREAS,** the American people have not so far appreciated the magnitude of this enterprise or the necessity of permanent and efficient organizations to carry it on, and

**WHEREAS,** if our people are not soon brought to a realization of these facts, disaster is bound to follow, bringing grave loss to them and reflecting discredit upon all engaged in this enterprise.

**BE IT THEREFORE RESOLVED:** That this organization pledges itself to work for efficiency and permanency in the personnel (of all departments engaged in this enterprise, for the elimination of partisan politics from the operation) and for the reward of ability wherever found.

**BE IT FURTHER RESOLVED:** That each individual member who is a believer in the dignity and importance of this work shall do everything in his power to sell the idea of clean cut business efficiency in highway operations to his legislative body and to his people.

## The Calf Path

I set out on my journey a long road,  
I sought a path that was not made,  
I sought a path that was not made,  
I sought a path that was not made,  
I sought a path that was not made.

But when I came to the end of my road,  
I found a path that was not made,  
I found a path that was not made,  
I found a path that was not made,  
I found a path that was not made.

I found a path that was not made,  
I found a path that was not made,  
I found a path that was not made,  
I found a path that was not made,  
I found a path that was not made.

I found a path that was not made,  
I found a path that was not made,  
I found a path that was not made,  
I found a path that was not made,  
I found a path that was not made.

And when I came to the end of my road,  
I found a path that was not made.

Each day a hundred thousand rout  
Followed the zigzag calf about.  
And o'er his crooked journey went  
The traffic of a continent.  
A hundred thousand men were led  
By one calf near three centuries dead.  
They followed still his crooked way.  
And lost one hundred years a day.  
For thus much reverence is lent  
To well-established precedent.

A moral lesson this might teach  
Were I ordained and called to preach;  
For men are prone to do as blind  
Along the calf paths of the mind;  
And work away from sun to sun  
To do what other men have done.  
They follow in the beaten track,  
And out and in and forth and back,  
And still their devious course pursue,  
To keep the path that others do.  
They keep the path a sacred groove,  
Along which all their lives they move,  
But how the wise old wood gods laugh,  
Who saw the first primeval calf.  
Ah, many things this tale might teach -  
But I am not ordained to preach.

- Selected.



## Serviceable Concrete Plus Concrete Service

When you start in on a job you want cement from us, buys service and prompt delivery, also, you can depend on.  
That goes without saying.  
But you want one other thing.  
And that thing is *dependable service*.  
We feel that the contractor who orders cement from us, buys service and prompt delivery, also, We assume that as part of our side of the contract.  
If you want not only good honest cement, but also efficient, and *prompt*, service, let us take care of you.

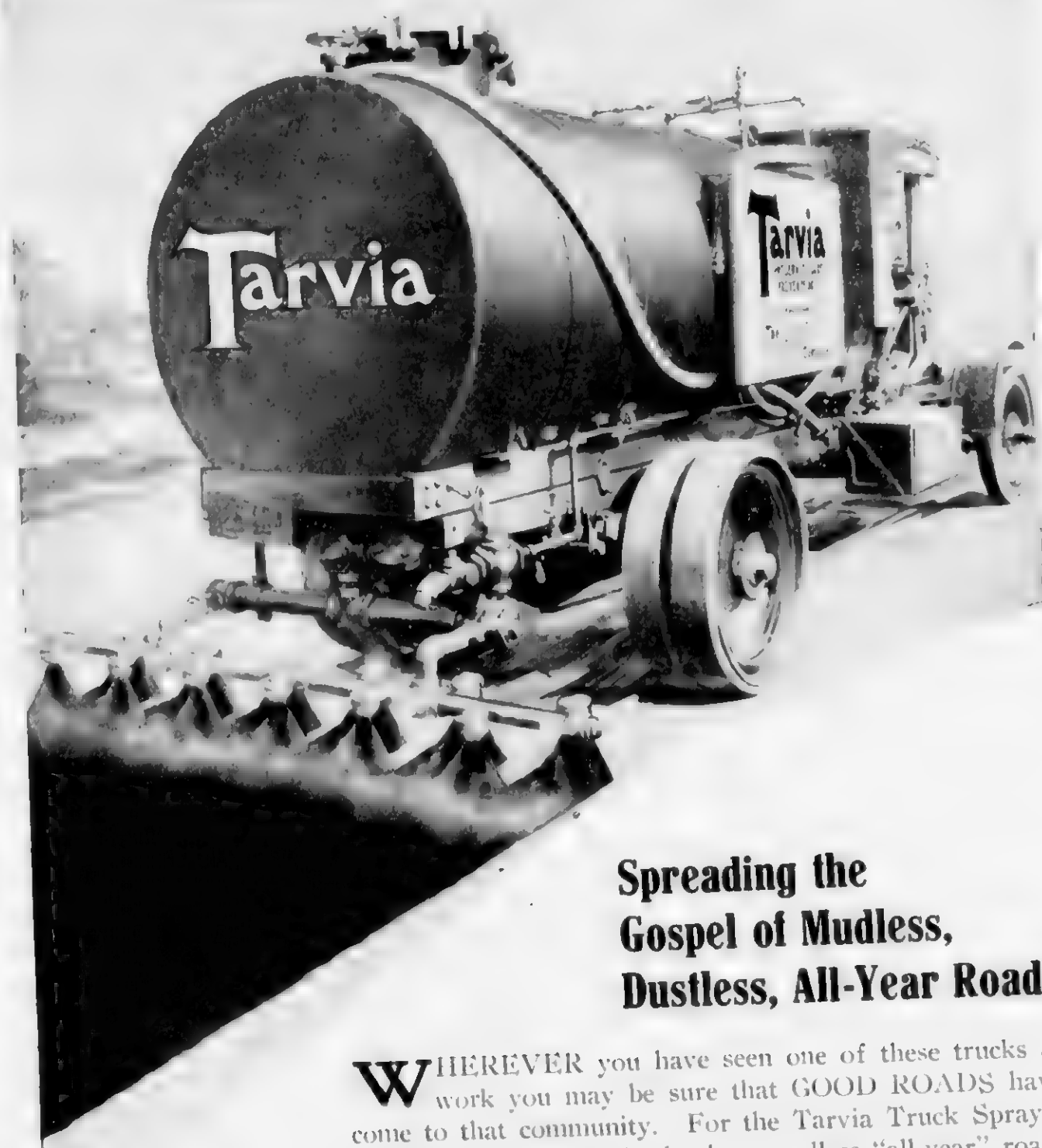
"For Cement you can depend on—use Dragon"

## Lawrence Cement Co.

PHILADELPHIA

302 Broadway, NEW YORK





### Spreading the Gospel of Mudless, Dustless, All-Year Roads

WHEREVER you have seen one of these trucks at work you may be sure that GOOD ROADS have come to that community. For the Tarvia Truck Sprayer is the herald of smooth, dustless, mudless "all-year" roads that are less expensive to build and maintain than any other type of modern highway.

How about the roads in *your* community?

If you have *any* road problems—either construction, maintenance or repairs—put them up *today* to the engineers of our Special Service Department. Their advice, based on wide experience with every type of highway construction, is free for the asking—and it involves no obligation whatever on your part. Please address your letter to our nearest branch.

The *Barrett* Company

40 RECTOR STREET, NEW YORK CITY

C. C. Randolph - Telephone No. 2466-Plainfield    C. A. Baker, Jr. - Telephone No. 323-Closter  
Ashley Burner - Telephone No. 2232-Plainfield    H. M. Smith - Telephone No. 96M-Riverton



(Courtesy Portland Cement Association)

*"Let's get together and talk cement"*

### The Road that Leads to Future Business

Every piece of pavement you lay, paves the way to something else.

Either to a good reputation, or to a "black eye."

That's worth keeping in mind when you order your cement.

We repeat, "Vulcanite roads *stay* right, because Vulcanite Cement is *made* right."

And with our plant capacity of 2,000,000 tons a year, we don't keep you waiting on deliveries.

**VULCANITE PORTLAND CEMENT CO.**

PHILADELPHIA

BOSTON

NEW YORK



### You Cannot Afford to Take Such a Dangerous Chance

Good weather; the gang broken in and working fine; the paving machine operating to full capacity; the job moving on schedule time; a good profit in sight:—AND THEN

*Your cement fails to arrive!*

Result: idle men; idle trucks; idle machines; but *overhead* going right on and eating up profits.

We are working *now*, 24 hours a day, in order that we can make immediate shipments, in any quantity, next season.

**EDISON PORTLAND CEMENT CO.**

NEW YORK

BOSTON

PHILADELPHIA

## ALONG THE ROAD



It looks pretty—if you don't have to go through it in a car! (State Hill near Stephensburg, N. J. Route 12, Jan. 13, '22)

### Boost For These Two Reforms

A "reform" has been defined as "something most people don't want, but a few are never happy till they get it."

That isn't true of the two things we are speaking of—the abolition of grade railroad crossings; and of unsightly signs along highways.

In connection with these two things, you will be interested in the stand taken by the nation's highway officials.

"Whereas, advertising signs upon, along and adjacent to public highways serve no good purpose but, on the contrary, are a public nuisance in that they destroy the beauty of our landscapes, impair vision in dangerous places, and add to the difficulty of properly guiding and warning traffic.

"BE IT THEREFORE RESOLVED: That this Association pledges its support to any proper movement to eliminate such advertising signs and urges upon its individual members the importance of aiding and encouraging legislation to this end."

"Whereas, Grade crossings of railroads and interurban lines with our highways constitute grave menace to human life and property, and

"Whereas, The increasing travel on our highways is each year making the danger greater and the list of dead and injured longer,

"BE IT, THEREFORE, RESOLVED: That this Association pledges itself collectively and as individuals to use its best efforts to speed up the properly planned elimination of grade crossings, especially on the main traveled highways."

The only way to bring these two reforms to pass, is to bring the pressure of public opinion to their support.

If you want to see our highways safe and beautiful, use your influence to set other motorists thinking along this line.



He tried to cross the railroad track  
Before the rushing train.  
They put the pieces in a sack—  
But couldn't find the brain!



BEFORE

—AND AFTER

These two photos, taken from the same spot, show the elimination of the grade crossing at Kinkora on Route 2. The first was taken in April, 1920; the second in December, 1921, showing the completion of the overhead crossing and pavement. (Note the three trees at left, and the telegraph pole at right, in both photos.)

## The Highwayman.

Tractor with Locomotive Type Snow Plow on Route 13, Lawrenceville-Princeton

March, 1922  
Vol. I  
No. 8

### The Highwayman Is Out For More and Better Roads in New Jersey

#### A 100 Per Cent. Success

The Highway Association Convention held in Trenton February 15th to 18th exceeded in size, interest shown, and in results, anything which had been anticipated by the most optimistic.

Every part of the long and complete program was well attended. The discussions made it plain that the boys who are actually doing the work are wide awake and "on their toes" concerning anything that will enable them to do better or faster work.

The "Second Annual Dinner" of the Highway Association, which was held in the evening, February 16, was also an unqualified success. More



"Our Flag", as it was displayed from the Stacy-Trent Hotel at Trenton

#### Echoes of the Convention—By an "Old Timer"

Our 1922 Convention has passed into history and we are all spurred on to do better work by its influence and words spoken there.

Since leaving its pleasant associations, this thought has accured to me: I wonder boys, if we duly appreciate the efforts and labor put forth in our behalf by all these good people—the labors and thought of our big hearted chiefs, Messrs. Wasser and Bedwell, Col Whittemore and other members of the Commission, our Division Engineers, Professor Gage and his laboratory assistants, not forgetting our own Lee and Charlie. It is no cinch to organize and arrange a good big dinner like ours; and the incidentals, besides the other various features of the Convention—I wonder boys, do we appreciate all these things? Let us do so now and by our united efforts and interest in our work show that their work has not been in vain—that we are glad to have had the opportunity

to be there and come in contact with them. Let us realize that we can only expect to get out of life what we actually put into it. If we put enthusiasm and cheerfulness and loyalty in our work, sooner or later, it will come back to us in the shape of larger usefulness and reward. This may sound somewhat old-fashioned to some of the young boys; but we all learn these things as the days go by. So let us now all rise up and give them a vote of thanks for their many kindnesses and trouble in our behalf.

What a wonderful dinner that was, and such an elegant array of speakers? Do you know, there are a good many real singers among these Highwayman? Why can't we have a glee club? The material is there all it needs is practice and development. I venture to say that there are several John McCormacks and Carusos in that bunch (Mr. Muir please note).



BEFORE—

A story without words (except those used by the owner of the car in the first picture). Route 2, Section 2, Station 1215; "before" May 14, '20; "after" December 28, '21.



AND AFTER



# The Highwayman of New Jersey

## The Highwayman

Published Monthly By The  
State Highway Department, at Trenton, N. J.

The HIGHWAYMAN will be sent free upon application  
to any citizen of New Jersey who is interested in  
More and Better Roads For New Jersey.

### THE HIGHWAYMAN

H. C. SHINN, Editor in Chief

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C. F. BEDWELL EDWARD E. REED  
CHAR. FISHBERG

#### Managing Editor

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#### State Highway Association

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1st Vice President - W. A. JOHNSON, Laboratory  
2nd Vice President - J. L. VOGEL, Bridge Division  
3rd Vice Pres. - WILLARD EMMONS, Equipment Div.  
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5th Vice President - WM. J. MCGOVERN, State Labor  
6th Vice President - H. D. ROBBINS, Construction  
Executive Secretary - EDWARD W. O'BRIEN

## Let Us Know How YOU Have Found the Roads!

With the increased investment of the public in good roads, it becomes more and more important to keep them open to traffic all year round.

The Department has made a particular effort this year to maintain traffic. In this effort we have had the splendid co-operation of every employee of the Department; and of the members of the Contractors, and their employees.

As this is the first year that such an intensive snow-removal program has been carried out, we are anxious to "check up" on it in every way possible—particularly from the public's point of view.

What has been your experience this winter?

We are just as glad to get helpful criticism, or practical suggestions, as to have letters like the following.

Let us hear from you.

#### A Letter From Dr. Lane

Tuckerton, N. J., 2-8-22.

Mr. Thomas J. Wasser  
State Engineer, Trenton, N. J.

Dear Sir:

I am taking the liberty to write and tell you how much I appreciate the efforts that have been made to keep the state highway passable this winter in this neighborhood. I am a country doctor and have to make use of the roads daily and in my thirty-three years of practice I have never found travel so good as this year. The idea of removing snow immediately is a most excellent plan and greatly saves the surface of the road. Deep frozen ruts are thereby eliminated and traveling made as good as in the summertime. I hope this kind of care will continue.

Very truly yours,  
J. L. Lane.



Chas. Fishberg  
Assistant Chief Clerk

If you have any occasion to come into contact with the "home office" at Trenton, you know "Charlie" without our having to introduce him to you.

One of Charlie's chief specialties is being Secretary of State Highway Convention Committees; he does this up brown as everyone who attended the Highway Association Convention last month, can testify.

Mr. Fishberg is another Trenton boy. He was born in Trenton in '96; and graduated from the Trenton High School in 1913. He took the Secretarial course at Rider College in '14; and followed this up with a School Efficiency Course; and still another in Pace and Pace Accounting and Business Administration.

In 1918 Mr. Fishberg was Secretary of the Rent Producing Committee; he is one of the organizers and Director of the Trenton Y. M. H. A.; and First Vice-President of the State Federation of Y. M. & Y. W. H. A's.

Charlie's regular duties include all civil service matter; all employees' records; the covering of all Commission meetings; and general administration matters in connection with the Chief Clerk. Outside of this, and the several activities mentioned above; he leads a life of indolence and ease.

P. S. We don't pin "morals" to many Highwayman tales; but it may be of interest to some younger men in the Department, to note the fact that Charlie kept on investing in fuel for his think-tank, after he had left school and gone to work.

#### And Our Reply State of New Jersey State Highway Commission Trenton

February 11, 1922.

John Lewis Lane, M. D.,  
Tuckerton, N. J.

My dear Doctor Lane:

Acknowledgment is made of your letter of February 8th, expressing your appreciation of the efforts of this Department towards opening the roads after the recent snow storms.

Those actually working in this snow removal program, that is, the Department employees and contractors of the State, working in conjunction with our forces, will certainly appreciate the commendation expressed in your letter, as same will be made know to them. Snow removal requires a great amount of persistent, steady work on the part of the men, but comment such as yours assures us that our efforts are appreciated. Thanking you for your letter, I remain

Very truly yours,  
T. J. Wasser,  
State Highway Engineer.

NOTE:—Read Mr. C. S. Edwards' letter on page 3.



Col. Schwarzkopf  
Chief of State Constabulary Forces

We are glad to introduce to readers of the Highwayman our good friend Col. Schwarzkopf. The experience of the Highway Department has been that with the col. "co-operation" is not only a theory, but is also practiced.

## "Co-operation" Being in Substance a Few Remarks Offered on the Occasion of the Highway Dinner

In Union there is strength and one of the greatest qualities and manifestations of that strength finds itself in CO-OPERATION.

In acknowledgement of this axiom it has been one of the most emphasized phases of the instruction of the members of the New Jersey State Police to impress upon each individual the absolute and imperative necessity of the practice of co-operation in each of its elements.

With reference to the Highway Department this instruction has encompassed the opportunities of the State Police to observe and remedy temporarily unsatisfactory road or bridge conditions, making report of same to highway officials without delay, reporting and guarding temporarily dangerous spots or conditions along the roads, reporting storm damages, road encroachments, new lunch resorts, new gasoline stations, and new refreshment booths, and regulating traffic and parking of cars along the highways, and preventing traffic congestion under those exceptional circumstances that might cause it.

On the other hand co-operation requires reciprocation. We have endeavored to establish the New Jersey State Police on the highest ethical standards. We have endeavored to impress the men individually and collectively with the privilege of service, the quality of honor, the ethical reward of duty well performed, the benefit of fidelity and the finesse of courtesy and consideration. These are elements easy to acknowledge but hard to practice and transgressions are frequently unintentional and go by unnoticed. Casual acquaintances are profuse in their praises but it requires the trust friendship and most sincere co-operation to point out ones faults.

Let us request of you that you give the State Police that most sincere co-operation and by telling us our faults and pointing out our transgressions assist us to a recognition and accomplishment in our field approaching that enviable position held in the Highway field by the New Jersey Highway Department.

## NEW JERSEY STATE HIGHWAY DEPARTMENT

March 1st, 1922

### Executive

Hon. EDWARD I. EDWARDS, Governor

The State Highway Commission

and

THOMAS J. WASSER, State Highway Engineer

### ADMINISTRATION

A. LEE GROVER, Secretary and Chief Clerk

M. L. HOWELL - Chief Auditor and Accountant  
CHAR. FISHBERG - Assistant Chief Clerk  
MISS GRACE WILLIAMSON - Chief File Clerk  
R. W. WILDBLOOD - Purchase Clerk

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C. F. BEDWELL, Construction Engineer

G. R. MOORE, Asst. Construction Engineer

R. A. MYERER - Right of Way Engineer  
C. A. MEAD - Bridge Engineer  
THOMAS GEORGE - Acting Supt. of State Labor  
C. A. BURN - Northern Division Construction Engineer  
H. D. ROBBINS - Central Division Construction Engineer  
J. A. WILLIAMS - Southern Division Construction Engineer

### MAINTENANCE, EQUIPMENT AND PROJECTS DIVISION

EDWARD E. REED, Assistant State Highway Engineer

A. W. MUIR - Superintendent of Maintenance  
N. C. APPELGATE - Superintendent of Equipment  
A. D. BULLOCK - Projects Engineer  
H. C. SHINN - Engineer of Special Assignments

### TESTING LABORATORY

R. B. GAGE, Chemical Engineer

J. G. BRAGG - Senior Testing Engineer  
F. H. BAUMANN - Senior Testing Chemist

## Announcement!

### Important to All Road Users

The New Jersey State Highway Commission will have an exhibit at the Atlantic City Hotel Exposition, Steel Pier, Atlantic City, New Jersey, April 24 to 29, 1922. The exhibit will be located at Booth 84; and will consist of Highway materials; photographs; literature; and plans and specifications.

Every owner of a car who visits Atlantic City between the dates of April 24th and 29th should make a point of seeing this extremely interesting exhibit.

CORNELIUS S. EDWARDS  
JERSEY CITY, N. J.

February 5th, 1922.

Mr. Thomas J. Wasser, State Engineer,  
State Highway Department,  
Trenton, N. J.

Dear Tom:

I want this letter to call to your attention the mechanics which were sent on from Trenton to follow up the trucks on our different routes during the last snow storm. A more efficient, hard working and enduring crowd of men, I do not think can be equalled in the State of New Jersey. They not only worked with their heads but with their hands and gave us the greatest amount of assistance.

Very truly yours,  
C. S. Edwards.

The names of the Men are:

William Ball, Montclair-Buter, Route No. 8.  
C. Richmond, Caldwell-Parsippany-Paterson, Route No. 12.  
M. L. Smith, Morristown-Whippany-Caldwell, Route No. 12.

# The Highwayman of New Jersey

5

## Building the Road Across Mullica River Marshes

Bids for the State Highway from Mullica River to New Gretna, Route No. 4 (Mullica River Section) of New Jersey Highway System, were received April 26, 1920, and the contract was awarded to the firm of Ross and Whelan, Inc., whose bid was the lowest submitted. Actual construction work was started May 26, 1920, and final completion of the contract was consummated July 1, 1921.

Conditions surrounding the improvement of this highway were unusually intricate inasmuch as the old road across the Mullica River marshes was exceedingly low and narrow, making it almost impossible for two machines to pass a given point at the same time.

The new road was constructed on the bed of the old highway and the width was expanded to a distance of thirty feet between the paralleling guard rails. The length of the road as it now exists is 2.75 miles and the average fill is about three and one-half feet. This fill was made of sand with an eight inch gravel top. One of the abnormal conditions encountered during the progress of the work was the continual subsiding of material, more than twenty feet of material being deposited in one place to counteract sinking.

Approximately three and one-half miles intervened between the borrow pits which were located near each end of the job. Two Erie steam shovels, one at each pit, were operated during the first five months of construction. One shovel loaded four trains of 24 inch gauge railway, each train consisting of 10 Koppel dump cars, hauled by a Plymouth locomotive. The other shovel loaded eight 3 1/2 ton dump trucks. Records show that an average of about 700 cubic yards of material was hauled per day. One shovel with the industrial railway completed the work.

Another condition harassing utilization of the road before the improvements was sporadic inundation. Formerly, it was a common occurrence for high tides to overflow the old road to such an extent that automobiles could not get through.

Experiences of this kind were met during the work of improvement. It was found that during a bad storm the heavy tide would wash away the banks of the new road. The contractors resorted to an ingenious and thoroughly effective solution of the problem by cutting sod from the meadows and placing it on the slopes. This sod consisted of tough meadow grass, the roots of which averaged eight inches in thickness when cut, and provided



Erie steam-shovel lowering three ton section of re-inforced concrete culvert into position.

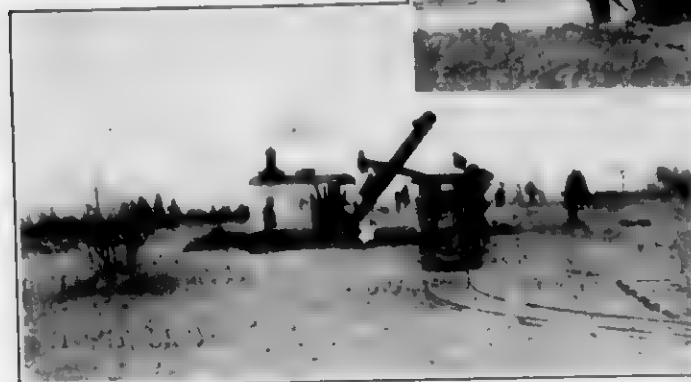
the scraper was put behind a truck. As a result of this innovation exceedingly fast time was made.

A culvert consisting of a double row of 54 inch re-inforced concrete was put in position to drain one of the creeks. This pipe, each weighing three tons, was placed on the timber grillage by means of the steam shovel.

## Some Interesting Facts About the Delaware River Bridge

Length of main span, longer than any existing suspension bridge in the world, 1,750 feet; clearance above mean high water, 135 feet; top of towers above mean high water, 385 feet; diameter of each cable, 30 inches; each cable contains 16,531 wires; diameter of each wire, 0.2 inch; total length of each cable, 3,534 feet; total weight of cable, 6,100 tons; total length of wire, 22,100 miles; total quantity of steel, 50,000 tons; total quantity of masonry, 320,000 cubic yards; total length of bridge, 1.82 miles; vehicular capacity of bridge per hour, 6,000; width of roadway between curbs, 57 feet (3 feet less than width of Market street); tracks for surface cars, 2; tracks for rapid transit, 2; footpaths (each 10 feet wide, elevated over trolley lines) 2; total number of vehicular traffic lanes, 10; total width of bridge over all, 125 feet.

Photos to the right, and below, show steam-shovel filling Koppel dump cars at



borrow pit. These were hauled to the job by a Plymouth locomotive, and dumped over the edge of the old road.

## Highway Engineering Course in the University of Pennsylvania

The first class of the Highway Engineering Course in the University of Pennsylvania, January 21 to February 10, 1922, was greatly benefited by the course. Attached is a copy of a letter which was addressed to Professor M. S. Ketchum and signed by the men who took the course, including those from New Jersey.

We understand that the men who came from Virginia to take the course are to write a summary of their impressions of the course in order that it may be used as a guide in preparing a similar course for the benefit of the Highway Department of Virginia next year and in future years.

In our opinion it is a thought well worth entertaining for the New Jersey Highway Department.

The boys say that eight hours a day of school work with a few additional hours in the evening preparatory for the next day's lectures is no cinch and if it were not for the interesting lectures which we received and an occasional humorous incident that relieved the serious part of the work it would have been impossible to hold the attention of these men for such a long period.

Jack Williams and Harry Shinn were coupled off in the laboratory work. While other groups found it difficult to check out with any great degree of accuracy on specific gravity tests, the Deval abrasion tests, etc., the Williams-Shinn section checked out with a degree of accuracy that even the professor in charge of the tests was somewhat skeptical. Williams-Shinn, however, still contend that there was a high degree of accuracy in their work which produced the results. Of course, it is no easy matter to take fifty odd pieces of stone and make them weigh exactly 5000 grams, but it can be done, claim Williams-Shinn. It seems that the section Harry Robbins was in in laboratory work was about to check out and they claim that somebody took a piece of stone that they had been working on, so that they could not check out properly.

February 8, 1922.

Professor M. S. Ketchum, Director, Department of Civil Engineering, University of Pennsylvania, Dear Sir:

The men now completing the Brief Course in Highway Engineering given by the Civil Engineering Department (January 23 to February 10, 1922) feel so greatly bene-



(Mullica Marshes)

In some places as much as fifteen feet of material was needed on account of continued sinking.

## What Wisconsin Is Doing in Roads 1651 Miles

The figures at hand—they are not complete—show that Wisconsin's road program for 1922 provides for the construction of 426.2 miles of concrete road. This will even surpass the big concrete road program of 1921. The year's plans provide for the improvement of 900 miles of road with gravel surfacing and 329 miles with miscellaneous types. The gang maintenance operations, which will run to over 1,000 miles, are not included as the figures are not available.

## "Sharp Turns"

By JAMES W. BROOKS

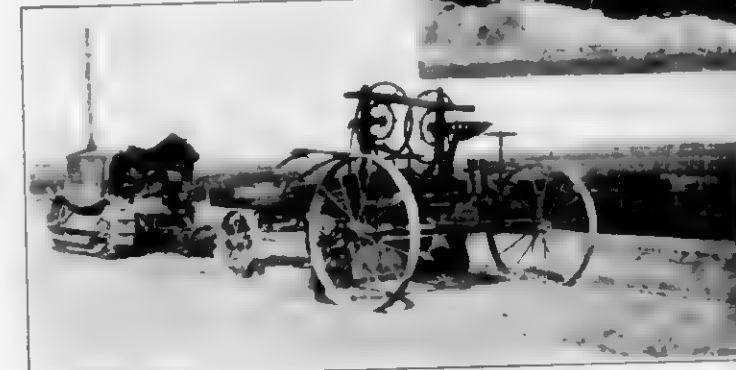
Bad roads collect toll on every turn of the wheel and give no receipt.

Unimproved roads are highway robbers and the wonder is why so many folks stand for a continuous performance in hold ups.

The merchant who gambles a page advertisement on the weather and bad roads, and then declines to support the good roads committee of his town is a gambler indeed.

Paved roads are the best forms of retail trade insurance, and annual renewals cost far less than on any other policy in road construction.

(Mullica Marshes) "Over the top"—or rather, over the edge; but five hours of hard work put it back.



(Below) Shaping up the road with a tractor and scraper; and removing the 24 inch gauge railway track.





## One Item in Good Roads Bill Which Should Be Eliminated

There is one item in the public's road bill which could be eliminated to the financial advantage of the taxpayer, were it not for that perennial pest—the partisan politician. The *Digest* has had occasion to use the word "iron" in this connection, and there seems to be no reason for letting the iron cool. The *Cincinnati Enquirer* uses it to advantage, in touching upon attempts in that State to discredit the state highway department in its policies of substantial construction as the only course in protecting highway investments. Says the *Enquirer*:

Experts appointed by associations representing the civil engineers and the confederates of the good roads movement organizations have, at the request of Governor Harry L. Davis, made examination into the charges that wasteful and profligate methods have been employed in building, under state supervision and account, part of the new highway between Columbus and Cleveland.

These experts have found little to criticize and much to commend in the undertaking, considering the unusual conditions surrounding the situation inquired into. Specifically the innuendo of dishonesty is repelled. It is now incumbent upon those who are responsible for the allegations of misconduct to produce the testimony upon which these assertions rest, it appearing, from their comment that they do not consider the report of the examiners to be decisive of any issue raised.

"In America there seems to have been lost that characteristic Anglo-Saxon trait of pursuing questions to the ultimate, the British notion of 'seeing things through.' Nothing is more common these days than the heralding of flaming accusations against public men and vocally vicious assaults upon private citizens; and their dismissal in whispers or the still, small voice. Our exaggerations come in the portal like elephants and go out through the keyhole like gnats. Psychologists would say

(Continued top of Page 7)

Down below, the Hightstown-Freehold road (Route 7) showing how the wind piled up the snow (above). Another bank, (Route 1, Robbinsville) which, considering the size of the big truck, gives one an idea of the depth of the drifts



After the January 23 blizzard—Route 1, Hamilton Square, N. J. But—

## Clearing 500 Miles of Roads in 24 Hours

When, last fall, State Highway Engineer Tom Wasser announced that "The highways of New Jersey must be kept open to traffic regardless of weather conditions", the General Public, remembering former years, added to this statement, as a mental reservation, the words "within reason!"

When, however, Mr. Wasser began to organize the forces of the Highway Department for the job ahead of it; and also reached out to enlist the co-operation of every road contractor in the State, it became evident that the job would be undertaken on a scale which had never been attempted before.

All this preparatory work was done far in advance—and then for a while it looked as if "there wasn't goin' to be no snow". There



Here is the same road (at another spot) less than twenty-four hours later

were a couple of little preliminary skirmishes, to be sure, but nothing severe enough to give a real test to the perfected snow-removal organization. With the end of January, however, came one of the severest blizzards the State had ever experienced. Unlike previous storms, it came from the south. Even this, however, did not catch the snow removal forces napping. Harold Noyes, the Weather Man, was right on the job; and twenty-four hours in advance predicted "heavy northeast storms coming from the south". Alex Muir took the night watch (having no wife, he was allowed to stay at the office!). He said it seemed as though he had charge of a highly trained football team, on the eve of the "big game" of the season. After weeks of waiting he felt



that this was a form of childishness. At the lowest it is not manly and in practice it produces moral degeneration and disrespect for government. The community should protect its honest public officials and not forever continue to expose them to the wild beasts with the callous understanding that they must defend themselves.—*Highway News Digest*

they might be over trained. The suspense and tension throughout the entire organization was much more wearing and nerve-racking, than the fight itself after the snow actually began.

The chief's principle in snow fighting is to begin when the snow begins and keep ahead of it. In some places, due to the extreme severity of the storm, it was not possible to do this; but the contractors, with the assistance of the maintenance forces and the equipment forces, were able to keep the main roads open and on all the main highways there was practically no interruption to traffic. As Ed. Reed put it "everybody was on the job; truck drivers, clerks, stenographers, bookkeepers, auditors, telephone operators, engineers, inspectors, foremen, assistant foremen, maintenance men, mechanics; in fact everybody in the organization co-operated to open the roads for the use of the public, and they worked to make Jersey Highway Service as famous as Jersey Justice has been for years."

There were some pretty stiff drifts, as may be seen from the accompanying photographs. The storm was about as severe a one as is likely to be encountered again for many years. The way in which the traveling public appreciated the service rendered by the Highway Department and the contractors is shown by letters which appear elsewhere in this issue and others which we will use next month. This appreciation has meant a lot to the boys on the job, many of whom worked all night to the end that traffic on the main highways might be continued "as usual."

## Wallace Considering Federal Road Program

The Secretary is considering a tentative draft of rules and regulations for the administration of the Federal Highway Act, approved last November, under which \$75,000,000 is appropriated for the construction of Federal-aid roads, but will not promulgate them until he has conferred with representatives of the State highway departments. The Secretary is impressed with the need for closest possible cooperation between the Federal Government and the States in the development of the Federal-aid highway system called for by the act, and the value and serviceability of the system will not be jeopardized by a hasty decision as to the roads which will comprise it or the regulations to be followed in carrying out the purposes of the legislation.

In formulating the fundamental rules which will govern the States and the Federal Government in administering the law, the Department of Agriculture is seeking the counsel of the State highway departments as represented by the executive committee of the American Association of State Highway Officials. Members of the committee are: George P. Coleman, State Highway Commission, Virginia; Paul D. Sargent, Chief Engineer, Maine; Austin B. Fletcher, State Highway Engineer, California; W. R. Neel, State Highway Engineer, Georgia; Thomas H. MacDonald, Chief of the Bureau of Public Roads, United States Department of Agriculture; George E. Johnson, Secretary, Department of Public Works, Nebraska; Ira

R. Browning, Member of Highway Commission, Utah; R. J. Windrow, State Highway Engineer, Texas; W. D. Uhler, State Highway Engineer, Pennsylvania; and D. P. Olsen, Director, Bureau of Highways, Idaho.

Pending definite decision upon details of the Federal highway system, each project submitted by the States will be examined with the utmost care by the Bureau of Public Roads to determine whether it is likely that the roads proposed will come within the Federal system as finally selected. The department regards the approval of this system as of great importance. Each project submitted in advance of the definite decision upon the system as a whole will have an effect in fixing particular routes and so determining the system.

Each State highway department has been requested to submit as soon as possible to the Department of Agriculture a tentative map showing routes proposed for primary and secondary systems. In examining and passing upon these recommendations special consideration will be given to social and economic question involved, such as service to population, established trend of traffic, existing industries, natural resources, etc. In considering plans for individual projects special attention will be devoted to grade crossings, gradients, curvatures, bridges general drainage conditions, location of material supplies, etc., but in the selection of the system the broader social and economic principles will govern.

Above, Route 7, Hightstown-Freehold, drifts piled over the top of the car. Below (Route 1, Hamilton Square—Robbinsville) a good example of the splendid work done by the snow plows belonging to the Department.



# The Highwayman

## Good Bridges Are as Important as Good Roads

The old saying that a chain is only as strong as its weakest link, holds true in road construction.

You know what it is to go sliding along a good road, and then come within an ace of breaking a spring to say nothing of your neck.



Bridge built by the State Labor Division at Budd Lake, Route 2, Section 2. Bridge in background supported by piers is trestle bridge for trolley cars.

...and bridge. Or perhaps, it is the risk of breaking through it.

The Highway Department has been making a thorough survey of bridges throughout the State and is planning bridge construction to keep pace with the road program, as may be seen from the following:

### Program of Bridge Construction

Route	M.P.	Location	Span	Road	Type of Bridge
6	26	Budd Lake	12 ft. 0 in.	30 ft. 0 in.	R. C. Box culvert with bottom slab, balustrade & extension.
6	25.1	Budd Lake	10 ft. 0 in.	30 ft. 0 in.	R. C. Box culvert with bottom slab, balustrade and extension plus four wing walls.
6	24	West of Budd Lake	31 ft. 6 in.	30 ft. 0 in.	Concrete abuts. and wing walls 1 beam floor, R. C. slab and balustrade.
6	23.8	West of Budd Lake	11 ft. 4 in.	30 ft. 0 in.	R. C. box culvert with 4 wing walls. Parapet at each end of culvert.
6	21	East of Hacktown	31 ft. 6 in.	30 ft. 0 in.	Concrete abuts. and wing walls 1 beam and R. C. slab and balustrade.
6	20.8	East of Hacktown	31 ft. 6 in.	30 ft. 0 in.	Concrete abuts. and wing walls 1 beam and asphalt floor and balustrade.
6	20.7	East of Hacktown	31 ft. 6 in.	30 ft. 0 in.	Concrete abuts. and wing walls 1 beam and asphalt floor and balustrade.
6	20.1	East of Hacktown	22 ft. 0 in.	30 ft. 0 in.	Concrete abuts. and wing walls 1 beam and asphalt floor and balustrade.
9	19.6	East of Lebanon	21 ft. 6 in.	30 ft. 0 in.	Concrete abuts. and wing walls 1 beam and asphalt floor and balustrade.
9	10.2	West of Clinton	4 ft. 0 in.	16 ft. 0 in.	Temporary bridge erected to maintain traffic.
9	10.3	West of Clinton	5 ft. 0 in.	16 ft. 0 in.	R. C. Box culvert curved wing walls. Side road culvert.
9	8.4	East of West Portal	10 ft. 0 in.	30 ft. 0 in.	R. C. Box culvert curved wing walls. Side road culvert.
9	10.6	West of Clinton	68 ft. 8 in.	30 ft. 0 in.	R. C. Box culvert, outlet slab, culvert follows up slope. Plate girder, cone, abuts, wing walls, R. C. floor, curb and drains by S. I.
9	11	West of Clinton	13 ft. 0 in.	30 ft. 0 in.	Cone, abuts. and wing walls, F. C. slab and balustrade. Temporary bridge erected.
9	12.4	Dunellen, N. J.	2 ft. 0 in.	41 ft. 0 in.	R. C. box culvert with 1 catch basin. Under trolley track. Placed new stringers and floor. Pointed masonry.
11	12.4	Kingston, N. J. 2 at So. of Elizabeth	12 ft. 0 in.	20 ft. 0 in.	Box culvert cobbled bottom. Galv. railing both sides.
1	4	Trenton, N. J.	4 ft. 0 in.	40 ft. 0 in.	Pointed abuts. placed R. C. slab with sidewalks and balustrades.
5	24.1	White Horse, N. J.	17 ft. 4 in.	40 ft. 0 in.	Pointed abuts. and center pier at W. L. and bridge seats.
7	8	West of Freehold	9 ft. 3 in.	30 ft. 0 in.	R. C. box culvert with 4 wing walls and parapet at each end.
7	8.1	West of Freehold	5 ft. 10 in.	30 ft. 0 in.	R. C. box culvert with 4 wing walls and parapet at each end.

### Summary of Work Accomplished by State Labor Division (Continued from January number.)

#### Route 1, Section 2, Menlo Park-Rahway

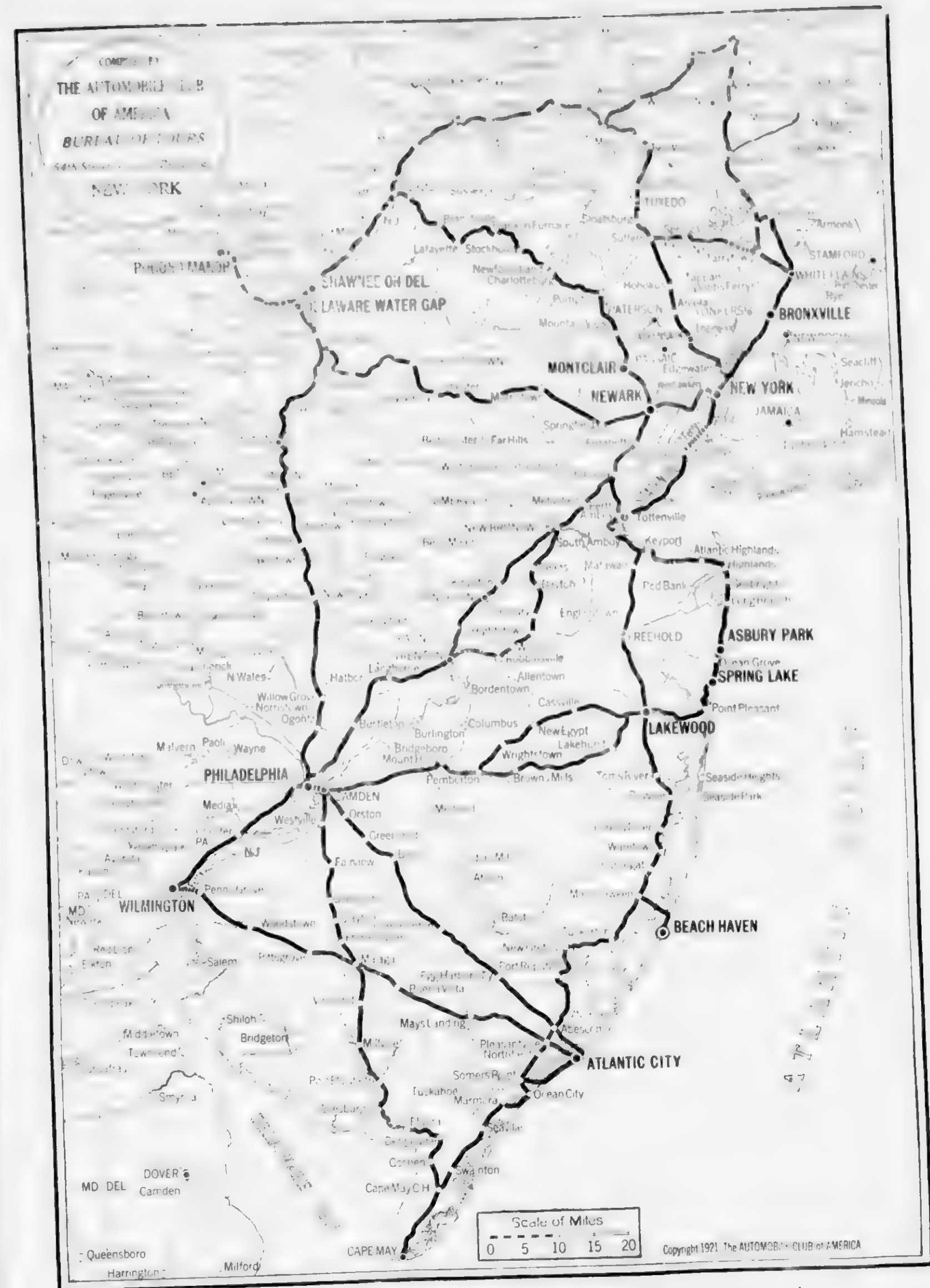
63 Norway maple trees were planted along the property of the Colonia Country Club in accordance with an agreement with them whereby they gave us right of way for the highway along their property. Ten of these trees died during the year, and were replaced by us in November.

The railroad tracks of the P. R. R. into the U. S. Hospital at Colonia, N. J., were taken up where they crossed the new concrete highway, and the gap in the pavement filled with reinforced concrete. Work was performed by local labor.

#### Route 9, Section 4, Dunellen

This improvement consisted of the grading and paving of 2525 feet of the section through the borough of Dunellen between Madison Avenue and Jackson Avenue. The pavement consists of two 12 inch strips of 8 inch bar reinforced Portland Cement concrete on either side of the car tracks, and necessary concrete curbs and intersections. The trolley tracks were lowered to the new grade and the ballasting done by the State Labor Division forces, the pavement between the rails to be done by the Public Service Co. Local labor was used on this work, and the principal construction items were:

3,297 cu. yds. of earth excavation



Reproduced by courtesy of the Automobile Club of America.



# Road Tips

## MONTHLY BULLETIN OF DETOURS

Adopted by the New Jersey State Highway Commission

Corrected to March 1, 1922

All detours posted with signs and blazed with "Arrows"

(Color signals to right will be used along all State roads as soon as possible.)

### ROUTE NO. 1—Rahway-Elizabeth: Union County

Use Route No. 1 which is open to Chestnut Street, Roselle. Thence over Chestnut Street to Route No. 9 at Roselle Park; and thence over Route No. 9 to Elizabeth.

### ROUTE NO. 9—Perryville to West Portal: Hunterdon County

Via Clinton, Glen Gardner, Hampton, Asbury, West Portal

### ROUTE NO. 12—Denville-Parsippany-Pine Brook: Morris County

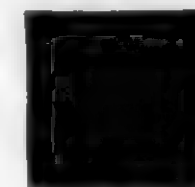
Denville, Tabor, Morris Plains, Morristown, Whippany, Hanover, Livingston, Roseland, Essex Fells, Caldwell and Pine Brook.

### ROUTE NO. 12—Phillipsburg to Port Colden: Warren County

Via Phillipsburg, Bloomsbury, West Portal, Asbury, Washington and Port Colden.

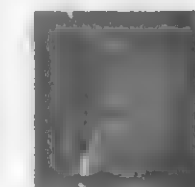


This color [blue] on posts or signs indicates that road is running North and South



Red shows that it lies East and West

While yellow tells you that it takes a diagonal course you h-e-east or north-west



And broken indicates that it takes a diagonal course north-east or south-west



### For You— "The Highwayman"

Do you use roads? Do you want to know where they are being built, and what detours to take, each month?

Then send, TODAY, to  
**The Highwayman**  
New Jersey State Highway Department  
Trenton, N. J.

Just ask to be put on The Highwayman's list. A postal will do.

### Turn Over!

On the Back You'll Find the Map.

## of New Jersey

9

This work consisted of lowering sidewalks to meet the grade of the new highway, setting curbs, resurfacing pavements, and retaining walls, putting trees and grading and approaches to the new highway at that place. Local labor was used on the work.

### Route 2, Section 2, Prince & Burlington Sts., and Park & Prince Sts., Bordentown.

This work consisted of lowering sidewalks to meet the grade of the new highway, setting curbs, resurfacing pavements, and retaining walls, putting trees and grading and approaches to the new highway at that place. Local labor was used on the work.

### Route 2, Section "A" Bordentown (near Thornton Creek)

Catch basin was built and 36 ft. for 15 in. T. C. tile drains to the basin was laid in order to remedy bad drainage conditions.

### Route 2, Section 2, Fieldsborough

This improvement included grading of property fronts along the new highway, building of concrete steps, sidewalks, driveway intersections, retaining walls, and necessary guard rail.

### Route 10, Section 1-A, Edgewater

The work at this place consisted of removing several thousand cubic yards of loose rock from the cliff overhanging the road leading from Fort Lee Ferry to Cliff side Park, the placing of wire guard fence over pipe guard rail on outer edge of road ascending cliff that was not protected by stone wall, underpinning stone wall along top of cliff, raising elevation of sidewalk in front of Carlston property along river road. The work was performed by local labor.

### Route 1, Section 3, Robbinsville-Windsor

This improvement consisted of paving space between concrete pavement and concrete gutters with stone blocks

This work consisted of laying new 12 in. concrete shoulders on either side of the concrete pavement through Mullica Hill, new concrete curb and gutter, and necessary drains, basins, sidewalks, etc. The work was performed by local labor, and the principal construction items were:

### Route 6, Mullica Hill

This work consisted of laying new 12 in. concrete shoulders on either side of the concrete pavement through Mullica Hill, new concrete curb and gutter, and necessary drains, basins, sidewalks, etc. The work was performed by local labor, and the principal construction items were:

1,000 sq. yds. of concrete pavement and driveways  
604 lin. ft. concrete curb  
1,900 sq. yds. earth excavation  
15 in. storm drains  
1 manholes

### Leesburg Camp

The useful buildings and equipment at the old Prison Camp at Leesburg were dismantled by local labor and shipped to Andover, N. J., to complete the camp at that place, which was turned over to the county.

### Andover Camp

The camp buildings were received from Leesburg and set up at this place by local labor, and the water and sewage systems completed, and the complete camp sold to the county.

### Fernwood Service Station

The sewage disposal system, the cement floor and the foundations of the 65 ft. x 100 ft. Paint Shop, and the concrete foundation, walls and piers for the 100 ft. x 400 ft. main building were built by State Labor Division forces.

### Rahway Garage

The concrete foundation and piers of the old garage were broken up and removed, and the building sections and equipment shipped to Fernwood, the new location for the State Highway Garage.

IN USE SINCE 1889  
**Dragon**  
PORTLAND CEMENT

You'll Bless the Day  
that You Met Up with "Dragon"

Every contractor knows what it is to have "concrete trouble."

A little of it goes a long way, and makes profits go glimmering.

Don't risk your profits on delayed cement deliveries.

We make a point of prompt shipments.

But what's more to the point; *we see that it gets there!*

And Dragon cement has been good reliable cement for a third of a century.

"For Cement you can depend on—use Dragon"

**Lawrence Cement Co.**

PHILADELPHIA

302 Broadway, NEW YORK



AFTER—Bernardville - Blazer's Corners Road, Somerset County, N. J., after paving with "Tarvia B."



BEFORE—Bernardville - Blazer's Corners Road, Somerset Co., N. J. Condition of macadam before use of Tarvia

### Save the old roads— then on with the new—

Every Spring finds scores of communities inaugurating systematic programs of salvaging the roads already built—putting them in shape to handle the growing traffic before new construction is begun.

The economy of such a sound Good Roads Program appeals to taxpayers everywhere.

How about the roads in your community? Quite likely the old, worn-out macadam that you have thought worthless can be quickly and cheaply restored to usefulness by a traffic-proof Tarvia top.

There may be other stretches that need nothing more than the time of a patrol crew to patch them with "Tarvia-KP"—or a simple treatment of "Tarvia-B" to pre-

serve the surface and make it traffic-proof and weather-resisting.

Tarvia roads are mudless, dustless, water-proof and automobile proof 365 days in the year. Their low first cost and economy of maintenance places good roads and their many advantages within reach of the most modest community.

This company has a corps of trained engineers and chemists who have given years of study to modern road problems. The advice of these men may be had for the asking by anyone interested. If you will write to the nearest office regarding road problems and conditions in your vicinity, the matter will be given prompt attention.

**Tarvia**  
For Road Construction  
Repair and Maintenance

The *Barrett* Company

40 RECTOR STREET, NEW YORK CITY

C. A. Baker, Jr., . . . No. 323-Closter  
H. M. Smith, . . . No. 96M-Riverton  
C. C. Randolph, . . . No. 2466-Plainfield  
Ashley Busner, . . . No. 2232-Plainfield



Courtesy Portland Cement Association

### "Here's the Bond = but Where's the Road"

That's a famous question—but you never heard it asked about a road made with VULCANITE.

No Sir! *Vulcanite* roads stay right because Vulcanite Cement is made right.

Our plant at Vulcanite (Warren Co.) has a capacity of *two million tons a year.*

*"Let's get together and talk Cement"*

VULCANITE PORTLAND CEMENT CO.

PHILADELPHIA

BOSTON

NEW YORK



### Our Production Capacity is Your Guarantee of Safety

Good weather; the gang broken in and working fine; the paving machine operating to full capacity; the job moving on schedule time; a good profit in sight;—AND THEN—

*Your cement fails to arrive!*

Result: idle men; idle trucks; idle machines; but *overhead* going right on and eating up profits.

We are working *now*, 24 hours a day in order that we can make immediate shipments in any quantity, any time.

EDISON PORTLAND CEMENT CO.

NEW YORK

BOSTON

PHILADELPHIA



## ALONG THE ROAD



This bridge at Black's Creek, Route 2, Section 2, was replaced by the bridge shown on page 8. The Department is replacing bridges of this type as rapidly as possible.

### Spring Roads

#### And Other Causes for Cusses

Well, I suppose you've been through it again, too. That photograph on the first page looks kind of natural, doesn't it?

But after you had paid for the team to pull you out, and figured in the wear on your car, and the tear on your clothes, did you add that sum to your "road taxes" for the year?

You should have done so, for expenses due to bad roads are really a part of your "road tax."

The "peepers" are out again; and they will soon be followed by the "croakers", who always begin to "tune up" in the spring, and predict how the country, or state, or county, is going to the everlasting daschunds because of the money being spent on roads. But fortunately the good roads will be here, long after the croakers have "croaked" and departed from this vale of tears to parts where paying is all done with gold—or good intentions.

### The Eternal Feminine

He—My dear, when I look over our expense account for the car and see how much it is, I can't help being alarmed.

She—Don't blame me; I told you not to keep an expense account!

### Speed!

He never could get a car  
Quite fast enough for him;  
He always scouted more  
Speed! "pop! vroom!"

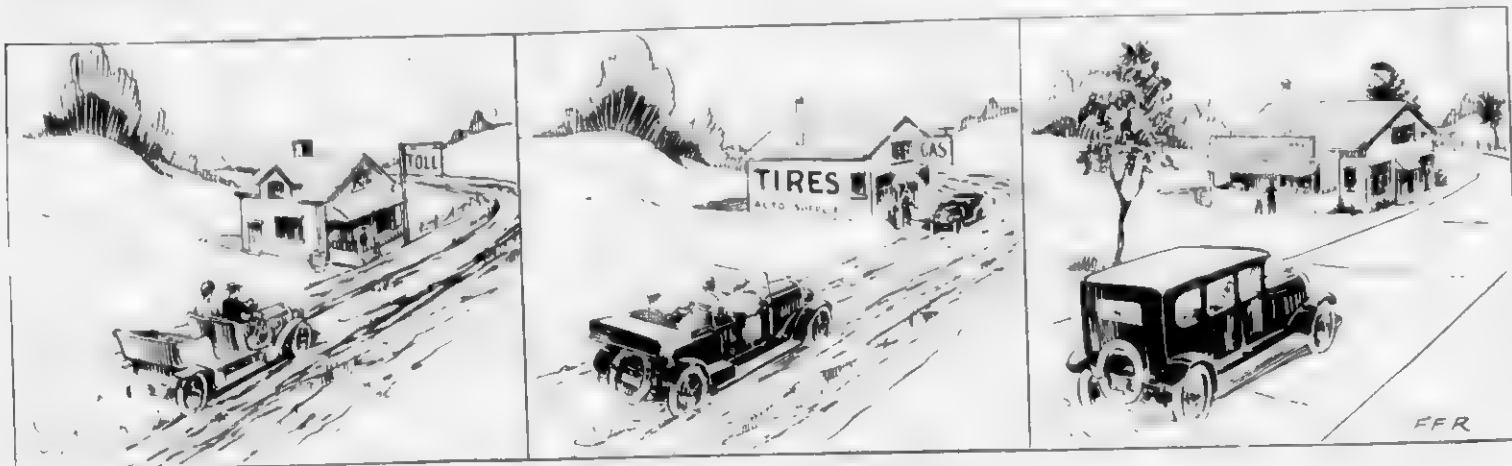
At last he found one that could do  
Ninety an hour, or more;  
But now, alas! he's through.  
He's riding in—a hearse.

F. F. R.

Your county, your town, will never "get anywhere" without good roads to get there on.

One of life's business riddles is why some folks kick about the cost of highway improvement, and then go on supinely paying double for lack of it.

The taxpayer who wants loads held down to fit obsolete roads rather than pay his share in building modern types, usually has very little to haul—with himself thrown in.



### ARE YOU STILL PAYING TOLL?

You remember the old toll gate? Not much better is the travel on a poor road, when you have to buy "gas" two or three times on a short trip. "The best road's the cheapest."

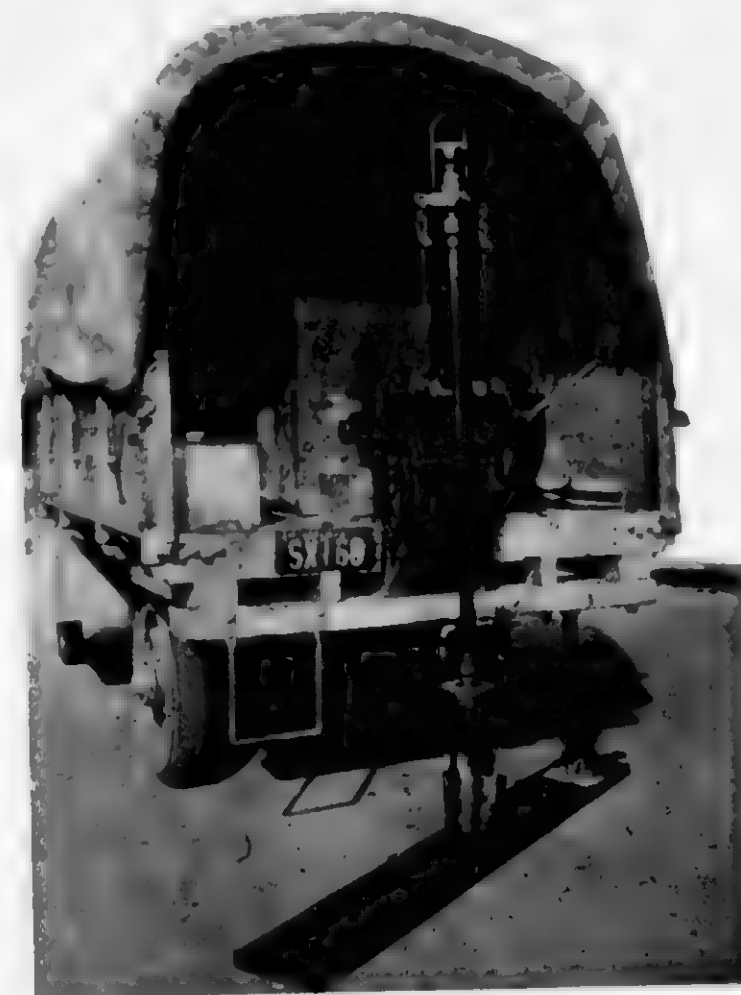
# The Highwayman.

Tractor with Locomotive Type Snow Plow,  
on Route 11, Lawrenceville-Princeton

March,  
1922

Road Builders' Supplement

Vol. I  
No. 8



### THE CALYX CORE DRILL

This machine is saving the tax-payers of the country hundreds of thousands of dollars on road-building. Its construction and operation are described in the following article. Even if you are not engaged in the business of road-building you will find the account of this machine and its work mighty interesting.

### Note

The papers presented at the recent Convention of the New Jersey Highway Association, and the discussions following them, are such a valuable contribution to the progress of road-building that it has been decided to publish them in full with as many as possible of the charts and illustrations used. (It has not been possible to include all of these, however, so there are occasional references in the text, to photographs and charts which have not been reproduced).

Our aim is to publish one or two of the Convention papers, with the discussion thereon, each month. We suggest that these be carefully filed, so that the reader may keep the complete set, which will make a very valuable addition to his road-building library.

This month we are printing "The Calyx Core Drill, and other Rock Drills for the Road Builder"; and also "The Organization and Operation of Motor Vehicle Equipment." Next month there will be published "Merits of Fine Gravel As Coarse Aggregate in Concrete for Roads", by J. M. Braly; and the discussion thereon at the convention; also "Recent Developments in Concrete" by H. C. Boyden, of the Portland Cement Association.



Photograph No. 37

Compare these cores with those shown in photograph No. 55 on the page opposite. The aggregate was the same in both cases: 1, cement; 2, sand; and 3, gravel, and yet— (see page 18)

### The Calyx Core Drill and Other Rock Drills for the Road Builder

By G. W. Morrison, Ingersoll-Rand Company

The company which I represent has had an Engineering and Research Department for a number of years. The function of this Research Department is to help solve the various problems of different industries and demonstrate to them that their work can be done better, quicker and cheaper by the methods we recommend than by those now being used or followed. In all probability we have available data on the problems you are now trying to solve. Our Engineering and Research Department is at your command and will gladly help solve your problems.

When road building began to receive so much attention a few years ago, we brought out a core machine suitable for road work. We called it a "Paving Tester." By means of it a 6-inch diameter sample core can be quickly taken of any existing or proposed road bed or road surface. By subjecting the samples to laboratory tests a complete understanding can be had of existing conditions and future plans made accordingly.

The accompanying photograph shows this machine better than it can be described. Your own Department have one of these outfits, and I understand they have made excellent use of it. I suggest you ask Mr. Gage to tell you about his work with it. I am sure his experience along that line would be very interesting to all. I happen to have a fairly complete report of what your neighboring State, Pennsylvania, has done with their outfit. I will try to describe it as best I can. Should Mr. H. S. Mattimore, Engineer of Tests, be present I would be glad to have him correct me if I get my facts or figures mixed.

They employ the machine to meet new conditions, and in determining the fitness of existing roads and to deduce basic principles for planning future highways.

For convenience, the equipment of the Testing Department may be divided into field or road equipment and laboratory equipment.

The field equipment, being necessarily portable, is carried in a three-ton army truck equipped with a five-ton engine, and consists of the following:

- (1) Pavement-Testing "Calyx" Core-Drilling Outfit, complete.
- (2) Apparatus for determining bearing power of soil.
- (3) Molds for concrete repair plugs.
- (4) Bins for cement, sand and stone for repair plugs.
- (5) Accessory tools for the work and any necessary repairs.

The photograph below shows the general arrangement of the component parts of the Calyx Pavement-Testing Outfit on the truck.

The drill head is a patented type especially designed for road-testing service, capable of taking cores from two to ten inches in diameter from hard pavements. Proper strength of rotation and simultaneous control of bit pressure are the functions of the drill head. The best results in drilling are secured by providing a pressure device which gives the operator complete control of pressure on the bit while drilling. By means

of a convenient ratchet wrench and worm gearing, hand pressure is multiplied about thirty times in its exerted pull on swivel and consequent pressure on the bit. Rotation of the bit is effected by the drill head spindle which is a hollow shaft with sliding fit in a keyed journal driven by bevel gears from the belt wheel.

The drill head is driven by belt from an eight H. P., two cylinder, four cycle, gasoline engine mounted in the forward end of the truck box with its own radiator and gasoline tank, so as to be independent of the truck for power or supply. The end gate of the truck has been removed to allow the Calyx drill head to be mounted flush with the end of the truck box.

Mounted back of the Calyx drill head is the water tank with capacity of 130 gallons. A hand force pump is supplied and carried with the equipment in case of an emergency, so that the tank can be refilled from creeks or rivers. Ordinarily not over three gallons of water will be used in drilling a core from an eight inch pavement, thus insuring adequate water supply for more than a full day's work.

Perhaps a word of explanation regarding the fundamental principle of a Calyx drill might not be amiss at this juncture. The drilling tool is a soft cylindrical bit with a flat or slightly rounded face rotated approximately 200 revolutions per minute on a thin layer of steel shot fed through the bit and lying between the bit and the material to be drilled. Pressure is exerted on the bit as it rotates breaking the shot into fine sharp edged pieces. These pieces being hard and brittle partially imbed themselves in the face of the soft steel bit and are dragged along by it, thus abrading the material below the bit and, of course, the bit itself to a very small extent. A slot is cut in the bit in such a manner as to continually work the steel shot to the cutting face and allow them to be crushed between the bit and the pavement. The shot as mentioned above are supplied through the inside of the bit and tend to work toward the outside but are caught by the slot and again forced under the bit. This cycle repeats until the shot are ground to a fine powder light enough to be carried to the surface by the water.

The water is fed to the cutting face to perform the double function of keeping the bit cool and at the same time wash the cuttings from the hole. As the drilling progresses a cylindrical ring is cut away and the core protrudes up inside the bit. When the hole has been drilled through the pavement, the bit is raised and the core lifted out and marked for future identification when shipped to the laboratory in Harrisburg where it is tested as described later. A clearer conception will be gained by noting the following slide of actual equipment and operation.

The field men have added an ingenious device of their own invention to counterbalance the spindle weight and quickly raise the bit during or after completion of drilling. A wire rope from the swivel running over a series of sheaves is attached to a sliding counterbalance weight on the side of the truck hood. By loosening one bolt the upper sheave over the spindle



Photograph No. 55

There were more cracks in one 900 foot section of the one pavement than in 9 miles of the other. It is easy to tell which contractors gave the State the most for his money! (see page 18)

can be lowered when not in use in case of very low head room.

The State Engineers of the large number of States now using this drill are practically unanimous in their opinion that proper investigation of existing sub-grade conditions, thickness of pavement, wear, test, crushing strength and uniformity of mix requires a core at least 6 inches in diameter. Consequently the majority of States have practically standardized on the 7 1/2 inch bit, which takes a core approximately 6 1/2 inches in diameter.

In starting a hole on the flat surface of the road a guide board is used for centering and holding the bit in place. After penetrating a half inch it is no longer necessary to hold the board as the bit has made its circular groove which holds it in place. A ring of wet waste or rags circled around the bit and jammed between the board and the pavement has been found by some operators to be a big help in starting the hole as the waste holds the shot to the bit. Shot should be fed at small intervals and in small quantities. An ounce or two at a time is better than larger feedings at larger intervals. A 7 1/2 inch bit will drill through an 8 inch concrete pavement in a period of fifteen to twenty minutes, depending on the experience of the operator, as well as the mix and age of the concrete or other hard surface. Three pounds of shot (which cost approximately 21 cents) will be found ample allowance for each hole.

Care should be taken not to use too much water, because the bit does its best work when working in a thin sludge of ground soil and rock with sufficient water to carry to the surface only the finest rock.

#### Apparatus for Determining Bearing Power of Soil

The apparatus for determining bearing power of the sub-grade is an auxiliary piece of equipment specially designed by the Pennsylvania State Highway Department's engineers. It is still experimental in construction, but promises to become an important part of the standard equipment.

The equipment is shown by the accompanying photograph and may be briefly described as follows: A collapsible tripod with telescopic legs supports a compound lever mechanism for exerting known pressures to a penetration rod. The exerted pressure tends to lift the tripod, but is prevented from doing so by the use of two holding down rods with special heads which hook under the pavement through the drilled hole. By a series of notches the penetrating rod is lowered to the varying height of the subsoil and the lever arm adjusted to a horizontal position. When the core has been removed after drilling, and also the thin layer of soil dammed by the water used, the tripod is set in position for the test. A graduated Ames dial indicates the depth of penetration in the sub-grade for the load is applied when weights are hung on the lever arm. Time readings are taken, so that the rate of penetration may be computed and the bearing power determined.

When starting a trip, the core drill crew is furnished a complete itinerary with exact locations on the various roads to be drilled. In addition to this, however, they are directed to drill cores from and take observations

at any unusual condition encountered. They average three to four cores per mile, or approximately one every 1,500 feet, plus the extra cores for unusual conditions.

It takes an average of 20 minutes to drill a core 8 inches in length from a concrete road; about 5 minutes suffices for the bearing pressure test. While the engineer is making the latter the mechanic is substituting a soil drill bit in place of the concrete drill bit and a 1 or 2-foot soil core about 2 1/2 inches in diameter is removed. These soil samples are for laboratory study.

While traveling from one location to another concrete repair plugs are cast in special molds for this purpose. The diameter of these is a little smaller than that of the bored hole. A four (4) per cent. solution of calcium chloride (CA C<sub>12</sub>) is used in making the mix, this appreciably accelerates the set. It is only a moment's work to place and grout one of these repair plugs with quick-setting cement, so that, when the testing outfit moves on, the road is left in good condition.

The outfit averages 16 cores per day. The success or failure of the finished road is largely dependent upon the quality and suitability of the materials used in construction.

In the testing laboratory all basic road materials are given thorough physical and chemical analyses. Varying proportions mixes are made and cast into cylinders or "cores." These latter are put through the compression and impact tests.

During the construction of a concrete pavement, certain States require that test specimens be cast from a representative batch of concrete for each unit of pavement constructed. These units may represent from 500 to 3,000 square yards of pavement, but generally about 1,000 to 1,500. The specimens thus secured are sometimes tested at the age of seven days, but generally not until they are twenty-eight (28) days old.

Later, drilled cores are taken from the completed road at approximately the same location. When these latter cores are tested, the results obtained are usually what was to be expected from the data obtained from the cast "specimens." Frequently, however, wide variations will be noticed. It is the drilled cores that tell the real story. Their bottom surfaces show the condition of the sub-grade. The cores will show if the mixing, placing, finishing and curing were done correctly. The drilled cores are virtually X-rays of the finished road and are the most reliable source of information.

Some conclusions drawn from data derived by means of the impact testing machine are:

1. The qualities of both coarse and fine aggregates influence both compression and impact wear tests.
2. The quality of the fine aggregate has a greater effect on the impact wear test than that of the coarse aggregate.
3. A 1:2:3 mix gives more uniform results in impact wear test than a mix with a larger proportion of coarse aggregate.
4. The 1:2:4 and the 1:1 1/2:3 mixes are affected to a greater extent by the qualities of the coarse aggregate than a 1:2:3 mix.
5. Where an excellent quality of fine aggregate is



to be used with a medium quality of coarse aggregate, a 1:2:3 mix should be used.

6. Where an excellent quality of coarse aggregate is to be used with a medium quality of fine aggregate, there is very little difference in impact wear between a 1:2:3 and a 1:2:4 mix, so it may be economical to use the latter.
7. More uniform results were obtained under impact wear test on specimens drilled from the road than on moulded specimens.
8. There is no direct relation observed between wear test and compression.
9. Machine finished concrete gives more uniform results in impact wear tests than hand finished concrete, although some specimens of the latter give high values.

A description of their compression (crushing strength) testing machine is not necessary. It is a standard universal testing machine.

Another feature which should be interesting to the road builder is that the pavement drill can be used for testing foundations for dams, bridges, etc. To do this work, however, some additional equipment is required, such as a set of Calyx drill tools and matching coupling, drill rods, etc. We would suggest size 3 or 3½ inch Calyx tools, as the cores secured with these sizes of tools are sufficiently large to give the required information.

#### Portable Compressors

Before the advent of the Jackhammer it was quite common practice to operate the reciprocating type of rock drill by steam. This was due to the length of time required to install a compressed air plant, and the cost of the compressor. This condition has now been changed. With few exceptions, the road builders' drilling problem finds its most satisfactory answer in the Jackhammer, a light-weight, self-rotating, hand hammer drill. This machine will put down holes of 6, 12 or 20-foot depth, according to its size, and yet is so easily handled that the holes can be drilled at any angle and in any place that affords a foothold for the drill runner. Jackhammers are the accepted standard, not only for the light work, such as removing out-cropping ledges, but also for heavy excavation bench work and tunneling. Jackhammer, by the way, is a trade-mark name, registered in the United States Patent Office.

The Jackhammer is now made in five weights or sizes. The three largest ones are made for use with steam or compressed air. These may also be equipped with arrangement for feeding water as well as air through the hollow piston and steel to the bottom of the drill hole to allay the dust and remove the cuttings.

Most of our Jackhammers will run on steam, but not nearly so efficiently as on compressed air. Therefore, good practice calls for an air compressor which is, first, reliable; second, easily portable; third, efficient; fourth, reasonable in price.

The development of the automobile engine and the many improvements in air compressor practice, coupled together, made it possible for us to solve the problem and furnish you with a portable outfit which fulfills the above condition. Such machines are now available in several different sizes, each designed to operate a certain combination of tools such as are customary in road building, quarrying, contracting, and other construction work. The illustration herewith will give you a good idea of the construction of these portable compressors. You will notice that they are operated by four cycle, four cylinder tractor type gasoline engines of proven design. The compressors are vertical and perfectly balanced. They are designed so as to give maximum strength and wearing qualities with the least possible weight. The radiator, air receiver, fuel tank, top and side curtains and all other accessories are arranged so as to make the machine compact yet easily "get-at-able." The entire outfit is mounted on a substantial steel truck.

The common practice is to haul these portable compressors from place to place with a team of horses at not to exceed a speed of six miles per hour, but necessity for quick transportation to distant points, such as public service work, has led a number of our customers to remove the wheels and axles and mount the outfit in standard auto trucks and trailers so that they may be moved at a speed up to 12 to 14 miles per hour.

For an outfit plant or similar, it is possible that a skid mounted compressor is preferred to a road portable machine. An outfit of this kind is fully self-contained, yet light weight and handy enough to permit convenient loading and unloading when being moved on the contractor's truck.

Where electric current is available a motor-driven compressor may be employed, retaining all the advantages of simple electric drive.

Where electric power is not available a steam machine skid mounted, may be used. The steam is furnished by a portable boiler. An outfit of this kind is fully self-contained and sturdy, yet light weight and handy enough to permit convenient loading and unloading when being moved on a contractor's truck. The larger types of compressors are purely stationary.

Alliced closely with actual road construction is the quarrying of stone for foundation, sub-surface or surface of the street or highway. There are three types of drills in most common use in quarrying: The well or churn drill, the "Sergeant" or tripod-mounted piston drill, and the Jackhammer drill. Each of these types of drills has its use in the quarrying of stone.

The proper field for the well drill is in such rock as laminated limestone or cement rock, i. e., for drilling such rock that will come down well broken up, after the powder gives it a good shaking-up and the rock fall from a fairly high face. (Well drills are used practically exclusively on high face, of course.) In hard rock it is very difficult to start a well drill hole and the drilling speed, of course, is much slower. Some rocks have been encountered that were so hard it was not practical to drill them with well drills.

When well drills are used in granite, trap rock, hard limestone, etc., there is usually an immense amount of secondary drilling to be done so that the blocks may be broken up in sizes that may be handled by the shovel. At times the cost of this secondary drilling and blasting exceeds the initial drilling and blasting costs, as well as interrupts the operations of the shovel crew.

Another point, in one well drill hole it takes a certain amount of powder to break the ground. In another hole nearby merely half the powder might do the work because of formation or strata differences, but there is no sure way of determining this so each hole must have enough powder to break the ground under the most adverse conditions. A lost well drill hole means a considerable monetary loss.

A very good average drilling speed for a churn drill in fairly hard rock is about twenty feet a day, two men operating the drill.

The "Sergeant" or tripod drill, with which I believe you are too familiar for me to describe in detail, is at its best when working on twenty-five to thirty-foot holes in brecciated, non-homogeneous, "poor-mudding," or "heavy drilling" rock. Here the heavy crushing blow and churning action of the reciprocating drill steel are very advantageous. Even in this kind of ground, however, it has been found in a number of cases that the use of the Jackhammer type of drill on shorter benches is more efficient.

Sixty feet of hole drill per shift is the good average for a tripod drill with two men.

One man with a Jackhammer drill can average 150 feet of drill hole per day, in the same kind of rock for which the drilling speeds of the other two types of machines were given.

There are many other advantages in using Jackhammer drills. They are very light and easily handled. No mounting is needed for them and no time is lost in making "set-ups." It is a matter of only seconds to start a drill hole with a Jackhammer. Drill holes may be placed easily and to best advantage. The powder may be properly distributed to break the ground most economically. The blasted rock is broken up in sizes which may be handled directly by the shovel without any secondary blasting.

When working fifteen to twenty-foot benches with Jackhammer drills, the work is much more continuous, labor may be minimized and the entire undertaking carried on much more economically and efficiently.

#### Paving Breakers

One of the new tools recently placed on the market in which road builders are interested is known as the "paving breaker." Its greatest use is for cutting asphalt



Photograph No. 42

These cores were taken from the section where the State paid for 6 to 8 1/2 in. of concrete and got only 4 in. This section has cracked badly under heavy traffic. (see page 18)

and breaking out concrete. In appearance it somewhat resembles a Jackhammer. It has a trigger throttle easily manipulated. It has no need for a rotating device and the piston strikes a straight hammer blow which drives the pointed steel into the solid concrete and wedges off chunks easily handled by one man. Two men, each with one of these machines, and a portable compressor does the work of fifteen men. Their greatest field is in cities where old pavements have to be removed. However, the tremendous changes in road requirements may soon make it necessary for some of our older concrete highways to be relaid, and if so it will be a great help to you. Public utilities find them a great help in laying conduits, enlarging manholes, etc.

#### Sand Rammers

The pneumatic sand rammer used in foundries is often a great time and labor saver in tamping back fill especially where paving has been removed and a trench dug for water or gas main or wire conduits. By tamping the fill with these pneumatic machines settling and misalignment of pavement is avoided.

#### Tie Tampers

Occasionally the road contractor has some railroad or street-car track to lay. Where such track has to be tamped pneumatic tie tampers greatly reduce labor cost and insure a much better track. These tools are very widely used by the transportation lines throughout the country.

#### Leveling Joints in Concrete Roads

When driving over concrete roads which have been laid for two years or more, one generally notices that the joints are higher than the rest of the surface. Considerable study has been given to this matter recently, due to the fact that engineers realize that a high spot causes a wheel of a truck or other heavy vehicle to strike a blow when it next comes into contact with the road surface after leaving the high spot. It does not take long for succeeding blows to start a hole, and when a hole is once started it soon assumes serious proportions and means a repair job. We are told these high spots are the natural result of the leveling board as it comes against the end form when the finishing coat is being leveled. As it seems impossible, or at least

impractical, to eliminate these high spots in the pouring and finishing operation, they must be worked down after the concrete is set. This can be done by means of small hand or pneumatic tools, known in the cut stone business as bush hammers, but either is a slow and expensive method, and much faster tools are advisable. A Jackhammer equipped with a bush-hammer type of bit has recently been suggested. It seems to have great possibilities, on account of its much greater size and power. It requires, however, closer regulation than is necessary for the ordinary rock drilling. To get the closest regulation and make the work easy on the operator we have suggested a two-wheel cart mounting with control levers running back to the handles of the cart.

The entire subject is still comparatively new and much thought will be given to it during the coming season.

#### General

The tools described above are those that the road builder is the most interested in, but there are many other types of pneumatic apparatus that you may or may not encounter, depending on the peculiar conditions surrounding each particular job. For instance, you may operate your own quarry, and in that event will need a stationary air compressor and possibly other types and sizes of rock drills, hoists, pumps, etc., and in this connection the following slides will be of interest.

There is one more thought that I would like to leave with you, and that is, in buying compressors don't buy too small a machine. You will always find more and more work that can be done most economically by compressed air, providing you have the compressor capacity to operate the necessary tools. I have yet to be criticized by a customer for selling him too large a machine, but many, many a time a customer has said to me: "Why did you not force me to buy the larger compressor when I bought last year? If I had it now I could run one more drill, or I could operate a hoist or scraper. The difference in first cost would not have been much, but now I will have to buy a complete additional machine." So I say to you, listen carefully when you are advised to take the larger compressor. If our experience can be considered typical you will find that it pays to buy the bigger unit.

by R. B. Gage  
Chemical Engineer, New Jersey State Highway Department

The core drill has shown us that we have been traveling more or less in the dark and that our assumptions were not justified. It is very seldom that a pavement or foundation has been found to have the required thickness at all points. It is doubtful if over seventy-five (75) per cent of the cores cut showed the pavement to have the required thickness. Since the specifications require the use of a definite quantity of cement per cubic yard of concrete and the quantity of concrete thus prepared is usually secured from the square yards of pavement constructed, it naturally follows that no change should be made in the proportions of the ingredients being used to correct the cement content unless it is definitely known that the excess or shortage of

Your attention is called to the difference in strength and variation in thickness of the cores shown below in photographs 37 and 55. There are more cracks in one 900-foot section of the one pavement than in nine (9) miles of the other. It is not necessary to state which one has the more cracks, yet both were constructed of practically the same composition and aggregate.



*This chart, which is the result of ten or twelve years direct experience in motor transportation, indicates the relation of the motor vehicle department and the balance of the organization. It shows also that the supervisor of motor vehicles has under his direct supervision the inspection and mechanical up-keep of the outfits. (see page 30)*

## Organization and Operation of Motor Vehicle Equipment

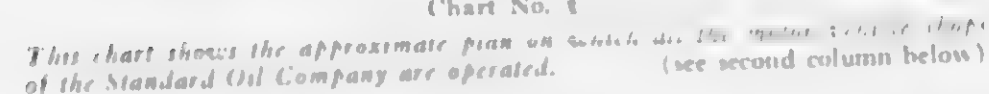
By J. F. Winchester, Supt. of Motor Vehicles, Standard Oil Company, N. J., Member S. A. E.

The machine is received, the old employe is laid off—lack of time and expense preclude the teaching of the horse-drawn vehicle driver how to operate the new outfit—and the new vehicle is placed in the hands of an experienced chauffeur. It does the work fine for a few weeks, then lack of inspection results in its having trouble, delays result, indifferent repairs are made, continual expense is entailed, and in a short time this concern feels that they have joined the class of "all going out and nothing coming in."

If this same concern was considering putting in an

However, Mr. Horine neglected to include the human element side of the question in his table of economic factors, which I consider has an important bearing on the efficiency of any operation. So much general knowl-





For instance, in road building it is not only necessary that a man have a general knowledge of the motor vehicle itself, but it is also necessary, if he is called upon to make an installation of any vehicle for road oil or binder distribution, that he have a general knowledge of the material to be applied by the vehicle and the various types of pumps that might be used for its application. His other general engineering knowledge would fit him to work up a design that would be suitable from a mechanical standpoint. The conditions surrounding an installation of this kind would be mounting, driving and gearing the pump so that it would be practical to operate, accessible, economical to maintain, and capable of giving the proper volume distribution for the various types of work encountered by the vehicle.

The chart also indicates that the Superintendent of vehicles has directly under his supervision men who handle the inspection and mechanical upkeep of the

Designing  
Pattern making  
Foundry practice  
Machine shop practice  
Tool making practice  
Blacksmith practice  
Electrical  
Painting  
Tin-smith  
Wheelwright  
Body building  
Carpenter  
Upholstering  
Stockkeeping  
Service problems, etc.

In my particular line, a canvas is made of the approximate number of gallons or packages that will be delivered in the respective territory under consideration. We study, particularly, the adaptability of the road to carry it so that we may have installed the proper transmission

Chart No. 6

This weekly shop report materially assists in checking up the shop activities and provides an index of the work accomplished. (see page 22)

After having taken into consideration the various possibilities, and it has been found feasible to make an installation if goods are to be economically hauled, the largest load possible under existing conditions should be hauled, for the reason that all operating figures will show that the unit cost, such as ton-mile, etc., is materially higher where small units are used. Also, from the standpoint of general operating economy, the installation of a heavy unit is preferable to a small one, as a large unit implies the problem of control and handling for the reason that fewer units are required.

In the operation careful study has to be made of the various factors noted in the chart. Particular care

Provision is made for the operator to have a given time each week to go over chassis, lubrication and other parts that may need attention. The operator has outlined to him the parts of the mechanism he is responsible for, which are indicated by an asterisk (\*) being placed beside these items on the inspection report. When the operator encounters trouble he cannot solve he turns in one of these reports.

They maintain constant schedules and visit a truck periodically. One inspector will take care of from fifteen to twenty-four vehicles, depending on the type,

[illegible]

Procedures are provided to control the vehicle when it is used in a controlled manner. The person who has the authorization chart his work, being that it is brought on the report during the day. The report is prepared by the crew equipment, which is held for the next shift period. Every effort is made to plan the movement into the shop so that the shift will receive prompt attention. The progress of the work is checked by a weekly Shop Report, illustrated in Figure No. 6, which materially assists in checking up the shop activities and provides an index of work accomplished. Therefore, it is best to

To obtain the most economical results, it is best to adopt the unit repair basis. This provides for the carrying of a number of complete units which can be readily substituted for the worn parts, and the worn parts can be undergoing repairs after the chassis is in the paint shop or on the road.

The shops are divided into departments, such as chassis, motor, gear box, rear axles, electrical, overhaul and a competent specialist is engaged for these respective duties. As a department grows, the old employee should be worked into a position of working foreman. This training should fit him to assume greater responsibilities. I find that more accurate and economical results are obtained under this method than by permitting a man to do all-round work, and, besides, through this system it is possible to detect the source of poor workmanship or failures.

Inspection is provided in each department through the activities of the foreman and final inspection of the complete job is provided for by a man who is entirely responsible to the Superintendent alone for the passing out of work.

Necessarily in an organization of this kind emergency service has to be provided. This is done by carrying a stock of parts at the main repair shop, and in small quantities at strategically located points. At the main station this stock-room provides for the shop needs, which facilitates repairs. In any organization where constant service by the vehicle is an asset, an efficient stock or service depot is a wonderful thing. It provides a means for filling wants in any emergency which places the vehicle in a position to operate at all time.

To provide proper service it is necessary that correct mechanical information be kept on file, and changes in the mechanical condition of a vehicle kept up to date. We provide for this by having a complete set of specification sheets, furnished by the vehicle manufacturer, which is filed with a standard mechanical information sheet as shown by Fig. No. \_\_\_\_\_. If these records are properly maintained the service man has a ready reference for each vehicle, which will remove a great possibility of incorrect parts being supplied.

A well kept truck should be kept painted periodically. Paint protects the wood and metal surfaces from the elements, and provides a means for increasing the value of the vehicle by making it a traveling advertisement. As I travel I am often surprised to note that some concerns pay many dollars for select sign locations along highways, etc., and then neglect their motor equipment. If advertising pays, I can conceive of no better medium than a well-kept vehicle which daily encounters many more people than the average signboard.

[illegible]

It is noted that the Department of Health and Human Services has taken the lead in the development of the proposed distribution of the vaccine. I would like to request that the Department of Health and Human Services, the State and Local Health Departments, the Federal Bureau of Investigation, the Department of Justice, and the Department of Education be included in the development of the vaccine distribution plan.

- Deliveries.
- Mileage Run.
- Gasoline Consumption.
- Stock keeping Records.
- Analysis of Distribution in the Central States.
- Analysis of Inspectors' Time and Expenses.
- Tire Records.

**Time Records.**  
and others from which we can minutely dissect the vehicle's efficiency from any angle that might be required.

We do no unnecessary work. As for instance you will notice that no mention is made on the form in Fig. No. —, of Cost per ton mile, but if for any reason this is desired, we can work out a particular example from the information at hand

Accurate records are kept of the various types of tires used. Tires are bought on an adjustment, or on a guaranteed price per mile basis. In order that the tires may be properly adjusted and that we may be in a position to compare the relative merits of one make with another, it is necessary that these records be maintained. The forms used in doing this are illustrated in group No. — of the various

Provision is made for taking care of the various types of tire equipment. In the case of solid or cushion tire equipment, a report is made when a tire is applied and its record is kept in the office on the solid tire record. In the case of solid or cushion tires, when once applied to a wheel, they remain there until finally worn out, with but few exceptions. These records are easy to keep as compared with those necessary for pneumatic tires.

Pneumatic tires, which are apt to come to grief through puncture, etc., require more detailed care on the part of the operator, and to assist him in keeping proper records we supply a definite set of forms which are illustrated in Fig. No. —. These forms facilitate the operator keeping an accurate record, and when a tire is sent in to a central stock room to be adjusted, it is taken care of through a special form of tag, which is used as a shipping and mailing tag. This tag is so arranged that it can be torn in sections when about to be used, and one of the stubs, bearing the same serial number as that part which has been sent through the mail and on the tire, is retained by the operator. Through this tag we are able to check shipments and mileage very accurately.

While it may seem to some that the expense involved is not justified, my experience clearly shows that accurate records of this description should be kept. It is surprising to note the large saving that can be effected with some types of tires as compared with others, both from a standpoint of Tire Cost per Mile, and Mechanical or Repair Cost per Mile.

A summary of the mileage obtained from all tires is made up semi-monthly and turned in to headquarters. These records give us a comparison between the different types and makes of tires.

Provision is made through these detailed reports,

## PAID FOR BRANCHES

[illegible]

Chart No. 7  
 I use a running form analyzes where the money spent on motor vehicles goes to and shows the results in groups; by make, capacity, type of service, year of installation. A semi-annual report is made from these items. (see page 22)

\* In this appendix, the PIVOTS are the  $2 \times 2$  submatrices of the  $4 \times 4$  matrix  $\mathbf{A} = \mathbf{A}(\mathbf{r}, \mathbf{r}', \mathbf{r}'')$  that has the same dimensions as the  $\mathbf{A}$  in Fig. 5.

Accounting norms may be viewed economically in two different senses, and on the one side it is common to find statistical methods used close to what is true, but approximately two-thirds of the sample of small, fixed charges, and on the third, Variable Charges.

Call this to your attention because it is a feature of the famous Moving Picture Vehicle feature in the store which should receive your attention. It is a vehicle as a motor car, but it is a motor car, exclusive and great to a land in the maintenance and upkeep factor. The car is built in modern machine will come practically constant in its operation and every day of its duration.

The present motor vehicle transportation delivery method is becoming more generally recognized by some of the larger companies. This is indicated by the demand for the large city bus, railroads, and transportation companies having in mind the adoption of unit carriers, which are really be-

transportation for the vehicle. One such installation is a traction drive being made by the Erie R. R. for the transportation of material between the Jersey City yard and New York City, and I believe other terminals have similar installations in mind. Traction companies are realizing that the locomotive can be adapted with profit, for use in urban transit, in many lines. These installations are being made only after a careful study of all angles pertaining to the problem, and there is no doubt but what the future will bring forth a considerable growth along this line. The possibilities of this type of transportation will for greater cooperation among all affected, and the industry as a whole should not be judged by past performances of many irresponsible operators, who, because of selfish interests, have not taken into consideration the rights of the public at large, which resulted in abuses piling up that have caused a general feeling of hostility toward this type of transportation. There is need for a greater cooperation if the operating problem is to be satisfactorily solved. Excessive taxation and restrictive laws which seem to be piling into existence over the country, will only result in the strangling of an industry, which is yet in its infancy.

By Norman C. Applegate, Superintendent of Equipment, N. J. State Highway Department

Mr. Winchester is to be complimented on such an excellent paper. The subject has been very thoroughly covered.

The biggest equipment problem that confronts the modern Highway Department is "Snow Removal."

A more complete and thorough organization is required for, and more wear and tear on equipment is sustained in one eight or ten inch snow-storm than in a whole season's ordinary work of construction and maintenance.

In discussing the paper your attention is directed to several conditions under which we are working which make our organization differ somewhat from that as outlined.

The organization as outlined by Mr. Winchester takes care of approximately 1,300 vehicles distributed over seven States, all of which are under his direct control.

The State Highway Department has a total of 417 motor vehicles, that is, light cars and trucks, and in addition also has approximately 175 other pieces of power equipment, including rollers, tractors, concrete mixers, steam shovels, pumps, etc., under the direct control for care and operation of the Equipment Division.

The Equipment Division acts as a trucking or equipment contractor to the other State divisions, such as Maintenance, Construction, Bridge, etc., and has full charge of maintenance and care and method of operation of equipment. The operators of these vehicles work under the supervision of the various superintendents, foremen and engineers as to hours worked and work done.

*Installation*

In reference to the installation of new types of equipment, this is a problem that we have not as yet had to go into very deeply. Practically the only installation in the last year has been the purchase of several Ford ton trucks and survey cars, which trucks and cars cover a field by themselves in which no other type of equipment would be suitable. In reference to the installation of the larger type of equipment, all the heavier motor vehicles now in use by the Highway Department are war surplus material. In the distribution or assignment of these vehicles to the various jobs around the State various local conditions, such as amount of material, approximate haul, source of material, whether new construction or maintenance work, and approximate length of time vehicle will be used on that particular job, are all taken in consideration.

The question of standardization is another problem which does not immediately interest us due to war surplus material on hand. When six or eight trucks are sent out to take care of a particular job we endeavor to have all trucks of the same make and type in order to simplify the work of the mechanic in taking care of them. In reference to heavier trucks, we are now using fifteen different makes of trucks and six different makes of touring cars. As stated before, practically all equipment is war surplus material, which has been transferred to the State at nominal cost. However, on gravel maintenance work and maintenance patrol units we have practically standardized on Ford ton trucks with the tilting hand-dump body.



{ 90 }

( ) 7 111 11

### Vehicle Inspection

111

1894, 1895, 1896, 1897, 1898, 1899, 1900, 1901, 1902, 1903, 1904, 1905, 1906, 1907, 1908, 1909, 1910, 1911, 1912, 1913, 1914, 1915, 1916, 1917, 1918, 1919, 1920, 1921, 1922, 1923, 1924, 1925, 1926, 1927, 1928, 1929, 1930, 1931, 1932, 1933, 1934, 1935, 1936, 1937, 1938, 1939, 1940, 1941, 1942, 1943, 1944, 1945, 1946, 1947, 1948, 1949, 1950, 1951, 1952, 1953, 1954, 1955, 1956, 1957, 1958, 1959, 1960, 1961, 1962, 1963, 1964, 1965, 1966, 1967, 1968, 1969, 1970, 1971, 1972, 1973, 1974, 1975, 1976, 1977, 1978, 1979, 1980, 1981, 1982, 1983, 1984, 1985, 1986, 1987, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 25

- Inside repairs
- Outside repairs
- Gas and oil
- Tires
- Operators' salaries
- Operators' expenses

### Tire Record

In general, the article by Mr. Winchester very thoroughly and fully covers the field of motor truck transportation and organization. He leaves very little in the field open for discussion except for the conditions as noted above, which conditions are those under which we are working at the present time, and which make our organizations differ somewhat.

# The Highwayman

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1922

Vol. 1  
No. 9



### Note

Our aim is to publish one or two of the Convention papers, with the discussion thereon, each month. We suggest that these be carefully filed, so that the reader may keep the complete set, in addition to his road-building library.

This month we are printing "Merits of Fine Gravel As Coarse Aggregate in Concrete for Roads", by J. M. Braly; and the discussion thereon at the convention; also "Recent Developments in Concrete", by H. C. Boyden, of the Portland Cement Association. Next month there will be published "Highways", by Hon. James H. MacDonald, Former State Highway Commissioner of Connecticut; and also "Precautions Necessary for the Proper Application of Glutrin to Gravel Roads", by Maurice R. Young, Contractor.

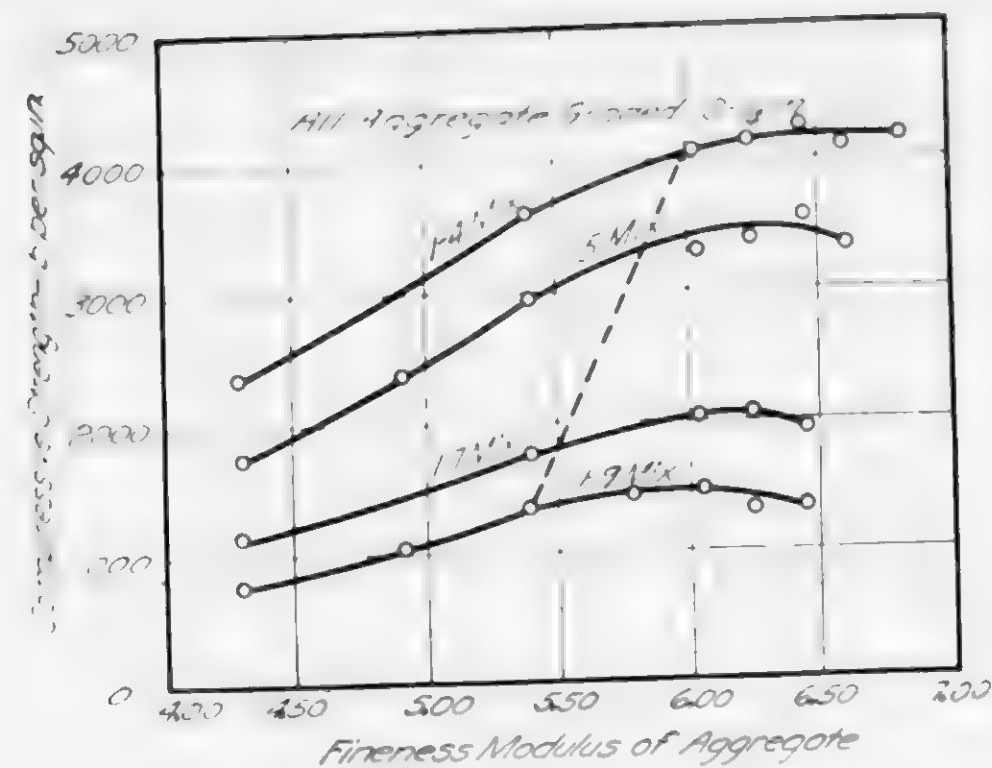


Fig. 1. Relation Between Fineness Modulus of Aggregate and Strength of Concrete.

Note that strength increases as fineness modulus increases up to a certain point, beyond which point the strength falls off, due to the fact that the aggregate becomes too coarse for the amount of cement.

## Notes on Recent Developments in Concrete

By H. C. Boyden, Portland Cement Association, Chicago

It is possible that some of the points to be brought out in this paper are more or less familiar to some of those present, through the reading of publications on the subject and the discussion of them in the technical press. There are many, however, to whom the facts will be new and of interest and the others may have questions they would like to have answered. If these questions are not answered in this paper, the Portland Cement Association will be glad to send further information.

The art of making concrete is an old one, but it is only in recent years that serious large scale investigations of its structure and the real effect of various combinations of the ingredients, have been undertaken.

In 1914 the Structural Materials Research Laboratory was established at Lewis Institute, Chicago, with Professor Duff A. Abrams at its head. The establishment of this laboratory was made possible through the co-operation of the Portland Cement Association and the Lewis Institute. This laboratory is a striking example of cooperation between an engineering college and a manufacturing industry of international scope.

There are only two ideas governing the policy of this laboratory: the first is, that the real facts regarding concrete and its ingredients shall be found out, with a liberal policy regarding the time required and the expense involved; the second is, that whatever the conclusions may be, they shall be given to the engineering profession for the improvement of the art of making concrete.

These investigations are still being carried on, but many points of vital importance have already been established. As an example, these data warrant the use of considerably higher unit stresses than those in common use today, with a consequent possible reduction in section. Conclusions have also been reached that will enable excellent results to be obtained with aggregates heretofore condemned, and also to increase greatly the ability of concrete to resist wear.

These conclusions and many others, are all based on tests running into the thousands and covering long periods of time. Incidentally, the laboratory is equipped for and is making close to 75,000 tests a year, so that there is no

lack of facilities for carrying out investigations in the most thorough manner.

### General

The study of concrete may be conveniently divided into three phases:

1. The study of the characteristics of the ingredients.
2. The study of the effect of making various combinations of these ingredients.
3. The study of the effect of the various manipulations of the ingredients in making and curing concrete.

This paper will touch on only those investigations that have brought out essential changes in previous ideas of the subject or that have confirmed those ideas beyond a doubt.

It has been the custom to speak of concrete as having three ingredients, cement, fine aggregate and coarse aggregate. The laboratory studies have shown the desirability of classifying the ingredients as cement, aggregate and water, or if it is still desired to maintain the purely arbitrary division of the aggregate into fine and coarse, to add the fourth ingredient, water.

Although cement is one of the most important ingredients of concrete, it requires probably the least discussion, as all the standard brands of Portland Cement on the market today conform to generally accepted specifications and laboratory investigations have brought out no essential need for changes in these specifications.

As stated above the aggregate has always been divided into two parts, sand, and crushed stone or pebbles. The line of division, purely an arbitrary one, is the quarter-inch screen, the portion passing through this screen being classified as fine aggregate or sand, and the portion retained on this screen being called the coarse aggregate. There is no particular advantage gained by this division but it would be much better to consider the aggregate as a whole, with a proper graduation of the various sizes from the largest to the smallest. It is not intended by this, however, to recommend the use of bank run or crusher run aggregate, as under no conditions should they be used without separating the sizes and recombining in the proper proportions.

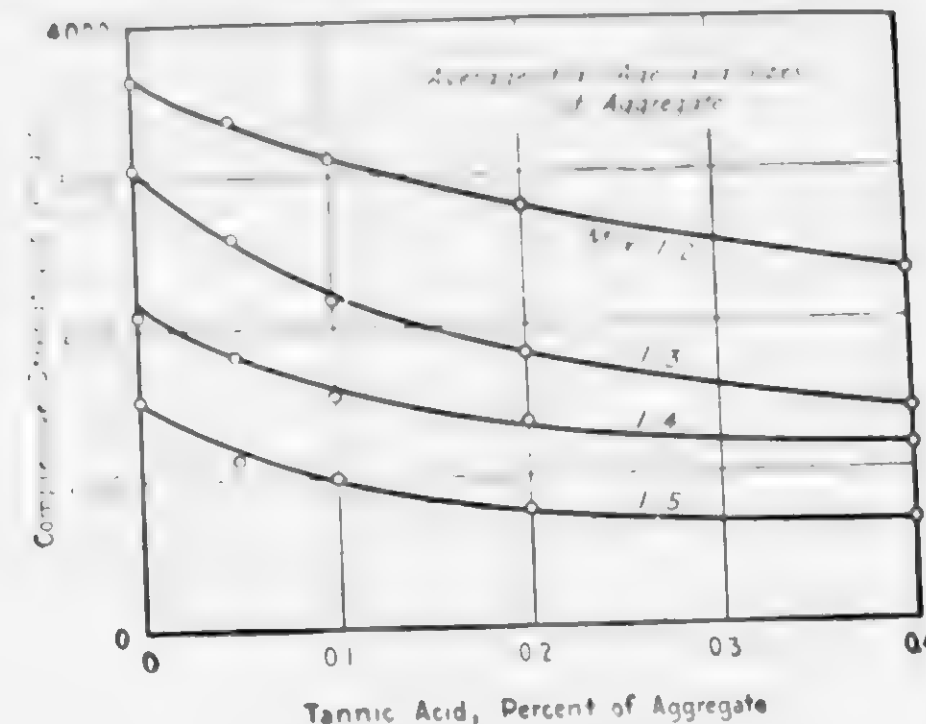


Fig. 2. Effect of Tannic Acid (Vegetable Matter) Upon the Compressive Strength of Concrete.

Note that one-tenth of one per cent of vegetable matter reduces the strength of concrete as much as 30%.

However, until such time as this method of considering the aggregate shall have become of general practice we will consider it as being divided into two parts by the 1/4 inch or No. 4 screen, and will so discuss it.

### Fine Aggregate

It is customary to specify that the fine aggregates shall be clean, sharp and not too fine. It would be better to omit the word "sharp", because rounded particles find their way into place more readily than do sharp ones, and require less water to produce a workable mixture. It is this lowering of the relative quantity of water used that causes the greater compressive strength found in concrete made with smooth, rounded sand. It would be well to insert the word "hard" because that quality is very desirable.

The laboratory studies have brought out two important facts regarding sands. One of these is the great importance of being sure that the material is clean, not only in appearance but in fact. Very often sand which appears to the eye to be clean, contains enough humus or vegetable matter to reduce the strength very considerably.

As an illustration, a clean sand gave a compressive strength at 28 days of 1,900 pounds. This same sand with one-tenth of one per cent of tannic acid added, gave a strength of only 1,400 pounds; in other words, one thousandth part of organic impurities in terms of the weight of the sand reduced the strength of the concrete over 25 per cent. In the investigation of the effect of organic impurities many natural sands were used, but as it was not feasible to secure sands containing a wide variation of organic impurities, tannic acid was used as a substitute for the purpose of making further tests. It was felt that the effect produced by such a material would probably be a measure of the effect produced by other organic impurities which might be present in natural sand.

How can these organic impurities be detected if they cannot be seen by ordinary inspection? By using the colorimetric test for organic impurities which was devised at the laboratory. This test consists of digesting a representative sample of the sand in a dilute solution of sodium hydroxide (caustic soda = NaOH) and observing the resulting color of the liquid.

All that is needed is a 12 oz. prescription bottle and a little 3 per cent. solution of caustic soda or sodium hydroxide, both obtainable at any drug store. Put in about 4 1/2 ounces of the sand to be tested, fill up to the 7 ounce mark, after shaking, with the solution of caustic soda, let it stand for 24 hours and observe the liquid on top. If this liquid is clear or light straw colored use the sand; if it runs into the brown color and especially dark brown, reject the sand or wash it thoroughly before using.

The second fact brought out by the laboratory studies is that fine sand behaves exactly the same as coarse sand except in one particular. In order to produce a plastic, workable mixture with fine sand it is necessary to use more water than with a coarse sand. It is the excess of water that reduces the strength of the concrete. In other words, if concrete could be mixed with the same quantity of water regardless of the grading of the sand, and a plastic mix obtained in both cases, the same strength would be secured in the concrete.

### Coarse Aggregate

When studying the characteristics of coarse aggregate one conclusion has been brought out very sharply; namely, that the hardness of the aggregate is a secondary consideration, as compared with other factors, in developing high crushing strength in concrete, and of less importance than ordinarily supposed in developing ability to withstand abrasion. This was very clearly shown in comparative tests made of burnt shale for use in building concrete ships. Samples made with this aggregate compared very favorably with those made with a much harder aggregate. A stone must be very friable indeed if it is not strong enough when properly combined in concrete, to more than maintain the load likely to be carried by the concrete.

The reason for the high compressive strength often secured where a light, soft aggregate is used, is because the porosity of the aggregate reduces the quantity of water available in the mixture. Here again the relative quantity of the mixing water is the governing factor.

For road surfaces, however, another quality is needed in concrete, namely, resistance to wear or abrasion, and to obtain this the stone must not be too soft. It is not advisable to use a stone with a French coefficient of less than 7 although pavements have given excellent results when made with stone having a coefficient as low as 6.

It is not intended in calling attention to the above results to advise throwing down the bars and allowing the use of any and all stones, irrespective of their hardness or wearing qualities. It is desired, however, to show that many of the safeguards that have been put into specifications in past years are not safeguards at all, and that the effect of following them may be entirely lost through neglect to observe other factors of more vital importance. It is always advisable to use the best materials obtainable; but there have been many cases when the local and easily obtainable material has been rejected, when it could have been used with excellent results, by following proper principles in proportioning and protecting the concrete; oftentimes better results would have been obtained than resulted from the use of imported materials and then neglecting the really important factors in making good concrete.



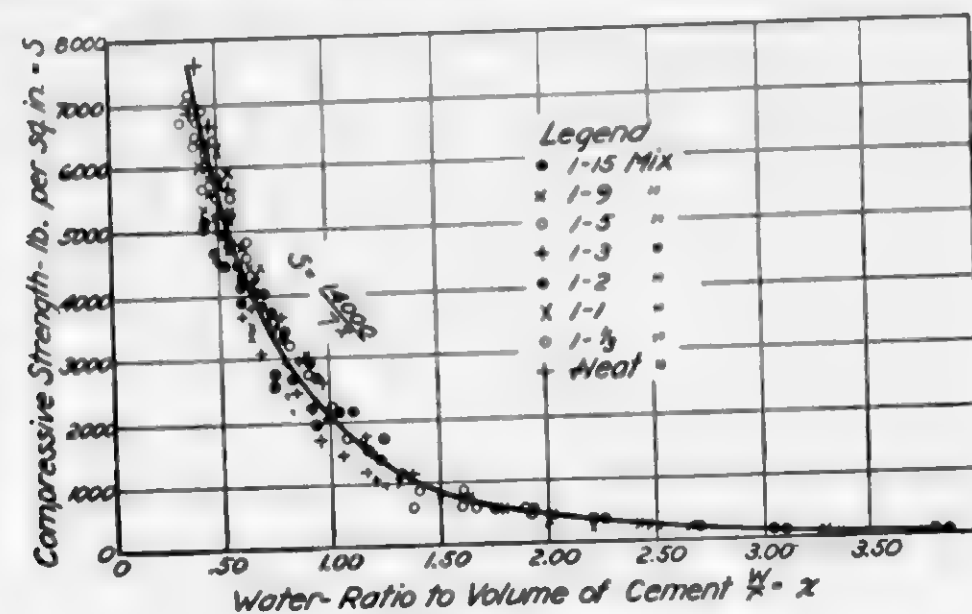


Fig. 3. Relation Between Water-Ratio and the Compressive Strength of Concrete  
Note that the lower the water-ratio the higher is the compressive strength

## Water

The remaining ingredient of concrete, water, is in reality of equal importance with the cement in obtaining good concrete, and yet it is often the most carelessly used and most loosely specified of all the ingredients, generally neglected in specifications and frequently not even reported in the published data of concrete tests.

The laboratory has conducted tests of waters sent in from all parts of the country, but definite conclusions have not as yet been published. It is safe to say, however, that waters which are strongly alkaline should not be used, and, owing to the possibility that marsh waters may contain sufficient humus matter to affect seriously the strength of concrete they should be looked upon with suspicion until tested in concrete and found satisfactory. A safe specification is to require that the mixing water shall be potable.

Regarding the temperature of the mixing water, tests have been made, using water ranging in temperature from 32 degrees to 212 degrees F. It was found that the temperature of the mixing water had very little to do with the strength of the concrete. The use of hot water is, however, a valuable aid in removing frost from the aggregate in cold weather, owing to its high specific heat, and may be used without danger of harming the concrete. Hot water tends to hasten the hardening of concrete.

## Proportioning

On studying the second phase of concrete making, there have been brought out at the laboratory, new, and in some ways radical changes in the past and present practices of proportioning.

These investigations have brought out the following facts: first, that the present method of designing concrete mixtures by using arbitrary volumes is wrong; second, that there is one single proportion which will give the best results with a mixture of given fine and coarse aggregates; third, that adding to or reducing the amount of cement is of value only as it affects the relative quantity of water required to make a workable plastic mixture; and fourth above all, that the water-ratio is the most important element of a concrete mix. The water-ratio as used by the laboratory, is the ratio of the volume of the water to the volume of cement in the batch. If 1 cu. ft. of water (7.5 U. S. gals.) is used for each sack of cement, the water-ratio is called 1.00.

The use of more cement in a batch does not produce any beneficial effect except from the fact that a plastic, workable mix can be produced with a lower water-ratio. The reason that a rich mixture gives a higher strength than a leaner one is not that more cement is used, but because the concrete can be mixed with a water-ratio which is relatively lower for the rich mixture than for the lean one. If advantage is not taken of this possibility of reducing the water-ratio the additional cement in the richer mixture is wasted.

## Fineness-Modulus

In studying the results of the tests of many samples of various combinations of aggregates it was evident that there must be some relation between the size and grading of the aggregates and the strength of the concrete. In trying to find this relation Professor Abrams struck upon what is called the "fineness modulus" of aggregates and when this was compared with the strengths of the concrete a direct relation was found to exist.

The fineness modulus is a very simple function of the sieve analysis of the aggregate used for any particular concrete. The aggregate is analyzed with a selected set of U. S. standard square mesh sieves, each one of which has a clear opening double the width of the next smaller. The following sizes are used: 100, 50, 30, 16, 8, 4,  $\frac{3}{8}$  in.,  $\frac{1}{2}$  in., 1 in. and 3 in. The percentages (by volume or by weight) of the total aggregates coarser than each sieve are added together, the sum of these percentages is divided by 100, and the result is the fineness modulus. The fineness modulus of any combination of the fine and coarse aggregates may be found in exactly the same manner. Aggregates of many different gradings may have the same fineness modulus; or in other words, aggregates of many different gradings may be used and still secure the same compressive strength in the concrete.

It is not claimed that this method of designing concrete mixtures is the only one that will give the desired results but the laboratory tests prove beyond a doubt that there is a direct relation between the compressive strength of concrete and the factor called the "fineness modulus". This is because the fineness modulus reflects the changes in the water-ratio necessary to produce a given plastic condition in concrete. Accepting this as a fact, it is possible to design a concrete mixture that will give a certain desired compressive strength from many different combinations of aggregates.

It is not possible in a paper of this length to go into the details of the use of this factor for the design of concrete mixtures, but they were published in the *Engineering News-Record* of April 17, 1919, and a careful study will enable one to use this factor successfully.

## Abrams' Tables of Proportions and Quantities

In order to make these principles more easily available to engineers, architects, contractors and other users of concrete, Professor Abrams has worked out tables of the proportions and quantities required to produce concrete of compressive strength from 1500 to 4000 lbs. per square inch, at 28 days. All the tests for the determination of the factors in these tables were made of concretes of varying consistencies, formed into cylinders 6 in. by 12 in. in size and tested at the end of 28 days.

In conformity with present practice the aggregate is divided in the tables into fine and coarse, and covers combinations of five classes of fine aggregate with eleven classes of coarse aggregate.

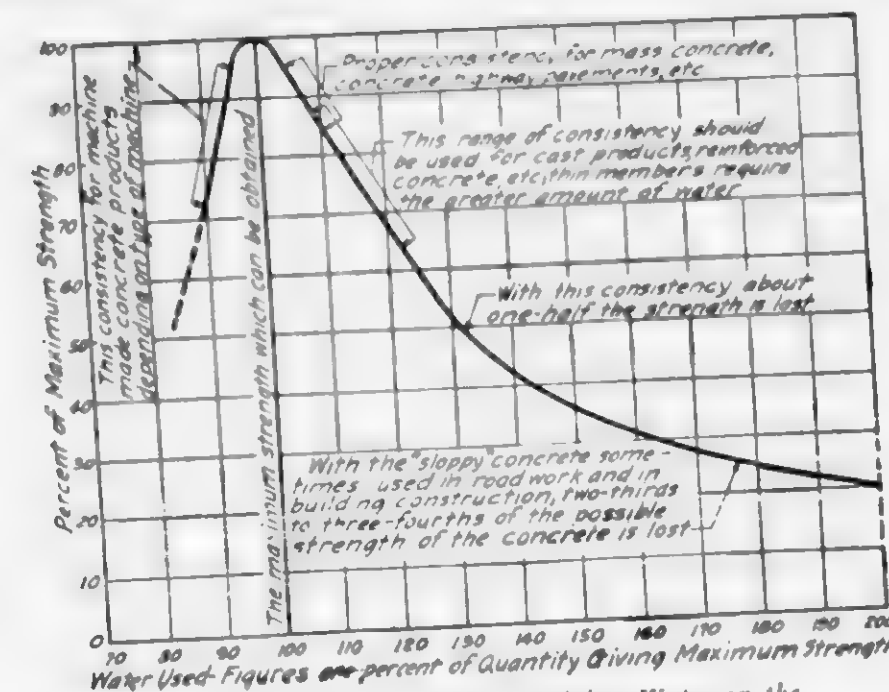


Fig. 4. Effect of Quantity of Mixing Water on the Compressive Strength of Concrete

Note: In general construction, the maximum strength can rarely be obtained, but it is possible to obtain 70% to 90% of the maximum strength without additional expense by watching the water content carefully.

Four different consistencies, as indicated by the slump of the concrete, are used for each combination so that there are 220 different combinations for each strength or 1320 combinations in all.

The quantities shown in the tables are considerably less than those shown in any previously published table due to the fact that they are absolutely net quantities based on laboratory methods of measurements of the aggregates. For this reason the quantities given should not be used for estimating without the addition of proper allowances for waste and the differences due to the practice of measuring aggregates in a loose condition when making field concrete.

These allowances should vary for each ingredient and also according to the particular method to be employed in handling the work. For general conditions the following percentages to be added to the table quantities are offered as a suggestion: cement 2%, fine aggregate 10% and coarse aggregate 7½%.

## Water Content

Upon studying the water content, the most radical change from previous ideas on the design of concrete

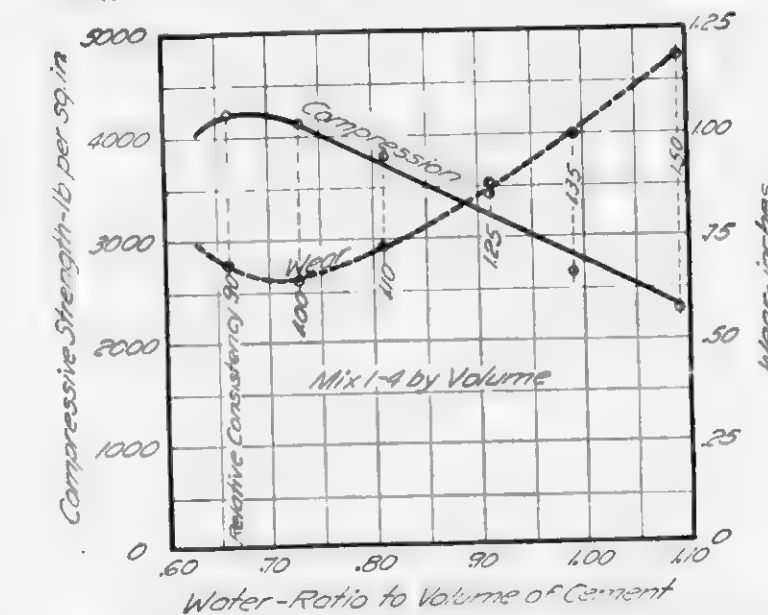


Fig. 5. Relation Between Quantity of Mixing Water, and the Compressive Strength and Resistance to Wear of Concrete

Note that the curves are practically the opposite of each other. In other words, that proper restrictions on quantity of mixing water increase the compressive strength and increase the resistance to wear (that is decrease the wear).

mixtures is found. Based upon thousands of tests it has been established that there is a direct connection between the relative quantity of mixing water used and the strength of the concrete and there is probably no other one factor which has so great an effect upon the strength as the water content.

It has been found that the less water used, as long as the mixture is plastic, and the aggregate is not too coarse for the amount of cement used, the stronger will be the concrete. This does not mean that the amount of water can be reduced too far, nor that, in actual construction, it can be reduced to a point that would give the maximum strength shown in laboratory tests. There is another factor that must be taken into account in construction and that is the workability of the mix. In general terms it can be stated that the lowest water-ratio should be used that will give a workable mix.

Within the range of plastic mixtures, the strength falls off very quickly with the addition of a small amount of water; so much so that in a one bag batch the addition of one pint of water more than is necessary to give a workable mix produces the same loss in strength as if two or three pounds of cement had been left out. Do not think from this that a very lean mix with a small quantity

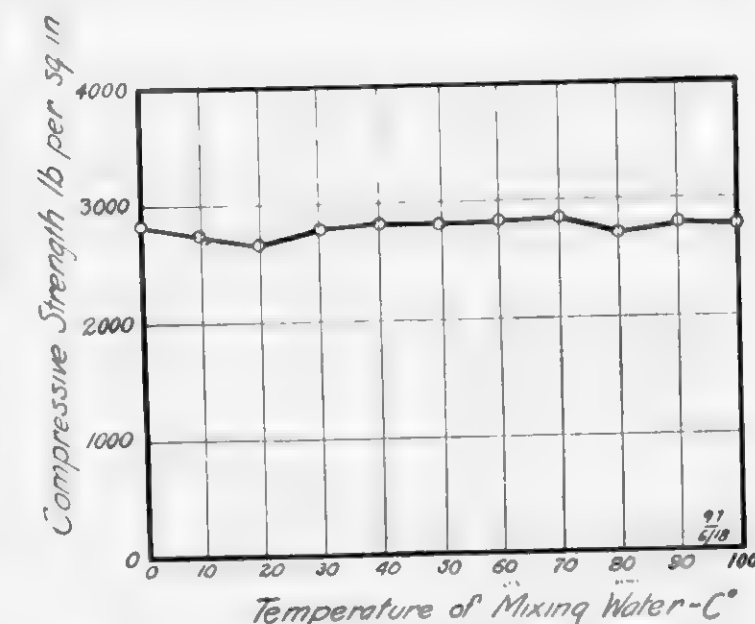


Fig. 6. Effect of Temperature of Mixing Water on Compressive Strength of Concrete

Note that no appreciable effect is produced by changes in temperature of mixing water between 32 and 212 degrees F.

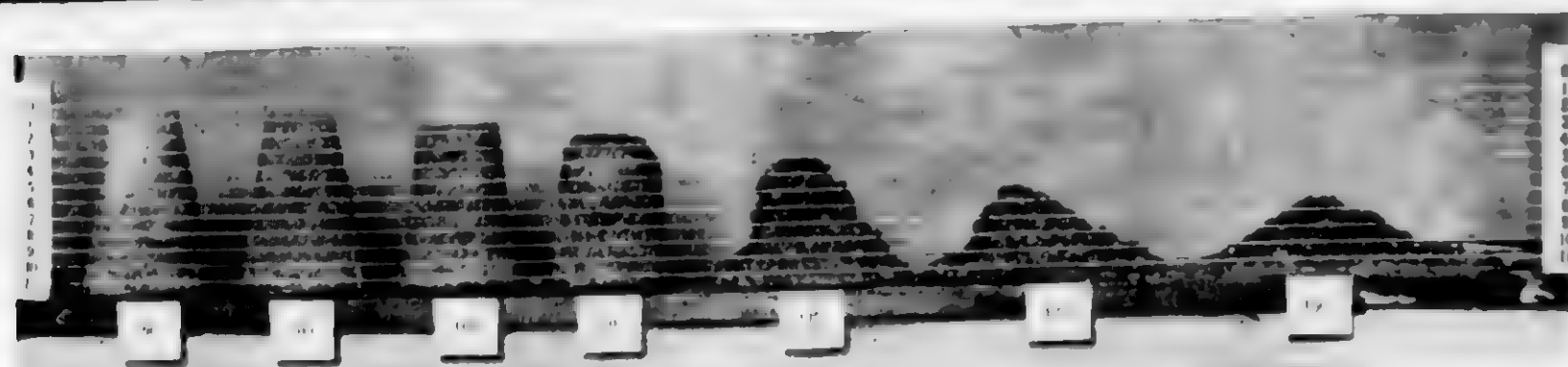


Fig. 14. Relation between Consistency and Slump

Note: Proper slump for roads and pavements from 1 in. to 1 1/2 in.; for foundation and mass work from 1 in. to 1 1/2 in.; for concrete containing reinforcing bars from 2 in. to 2 1/2 in.

of water will give as strong a concrete as a rich mix with the same quantity of water. This is not true, because it will require a higher water-ratio to produce a workable mix with the lean mixture, thereby causing a loss in strength.

The proper consistency for concrete will vary according to the use to be made of it. If the concrete is to be used for roads a dryer consistency is permissible than for concrete containing reinforcing bars. The use of mechanical tamping and finishing machines in concrete road construction has made it possible to use the dryer consistency economically, but any method which reduces the water content, such as the use of the light roller, will produce beneficial results.

The very wet sloppy mixtures that are being used in building construction may seem economical from the contractors' point of view but they are certainly extremely wasteful from the designers' and owners' point of view, since in many instances 50 to 60 per cent. of the possible strength of the concrete is being thrown away.

It may not be possible to reduce the amount of the water to the ratio necessary to give the maximum strength, but it certainly can be cut down below the amount commonly used, and the additional strength thus gained will be of

and also because of the varying moisture content of the aggregate. However, a few approximate quantities for different proportions of well graded aggregates up to 1 in. in size, may be given to form a basis for trial of the particular mixture at hand. 1:2:4 mixture will require from 6 to 6 1/2 gallons of water per sack of cement, a 1:2:3 mix, 5 1/4 to 6 gallons, and a 1:1 1/2:2:3 mix, 5 1/2 to 6 gallons.

#### Slump Test

In order to have a simple method for determining the proper consistency in the field the slump test has been devised. At first a metal cylinder 6 inches in diameter and 12 inches high was used, but now a frustum of a cone 4 in. in diameter at the top and 8 in. at the bottom, and 12 in. high has been adopted as a standard. This cone is filled with the concrete to be tested, which is carefully worked with a pointed metal rod while it is being placed, the form is immediately lifted off, and the settlement or slump measured. The proper slump for a mixture to be used for a concrete road surface is 1 in.; for mass work, from 1 to 1 1/2 in., and for concrete to be used in structures with reinforcing bars, 2 to 2 1/2 in. In some classes of reinforced concrete work increased plasticity or flowability may be needed. It must only be obtained by

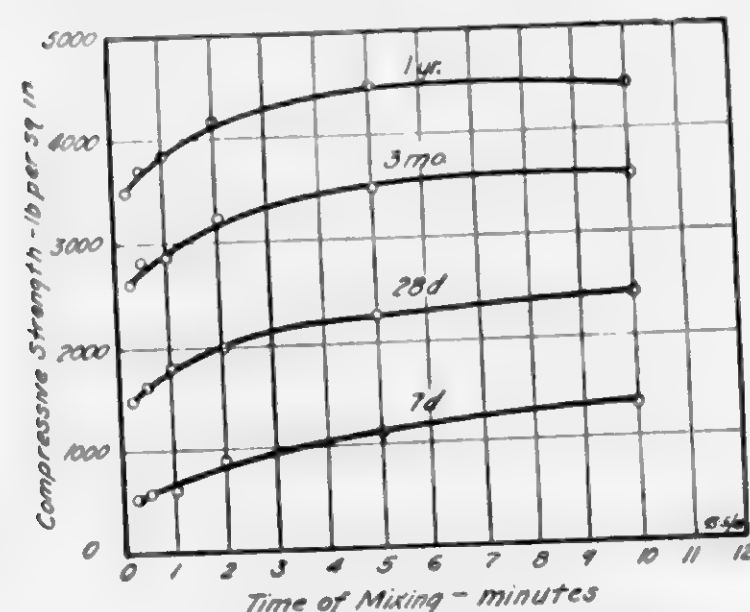


Fig. 7. Effect of Time of Mixing on Compressive Strength of Concrete

Note rapid increase during first minute, slightly less increase during second minute, and slight increase during remainder of time of tests.

advantage in the design of concrete structures. The designing engineer figures on a compressive strength of 650 lbs. per sq. in. and expects to get a factor of safety of three, but does not get it with the sloppy mixture often used. By cutting down the water to the proper ratio, a factor of safety of five or six can be secured, or the present allowable unit stresses can be raised.

The exact amount of water required for any particular mixture of aggregates to obtain the greatest strength in the concrete cannot be given, because of the impossibility of determining what amount will produce a workable mix

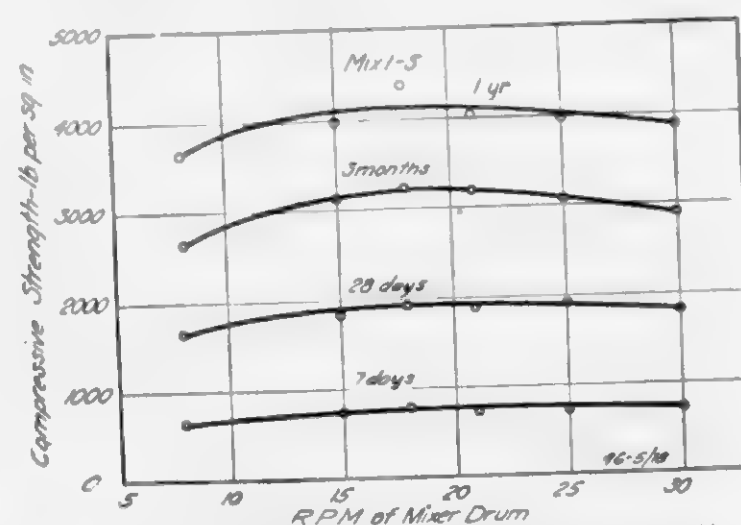


Fig. 8. Effect of Revolutions Per Minute of the Mixer Drum Upon Compressive Strength of Concrete

Note that between 12 and 25 R. P. M., the speed of the mixer drum has practically no effect on the strength of the concrete. Concrete mixed one minute at 12 R. P. M. gave the same strength as that mixed one minute at 25 R. P. M.

adding cement as well as water, in such quantities as to maintain the proper water ratio, otherwise a serious loss in strength will occur.

#### Manipulation of Ingredients

In considering the final step—the manipulation of the ingredients during the making of the concrete—careful studies have been made of each operation. Included in this phase are the operations of mixing, transporting and placing, and also the curing or protecting of the concrete during the early hardening period, which is one of the most vital operations in the making of good concrete.

The time of mixing is a matter of importance in obtaining good concrete and as this factor largely controls the

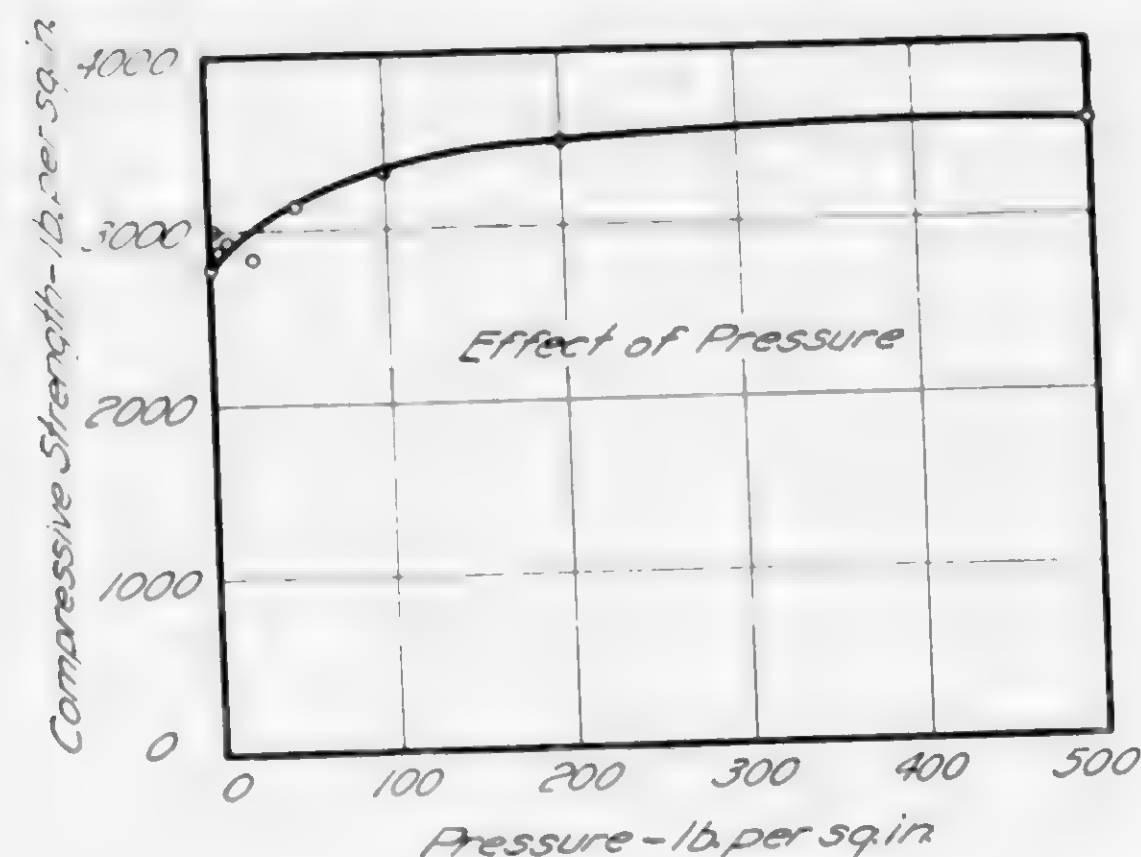


Fig. 9. Effect of Pressure Upon Freshly Moulded Concrete

Note that the compressive strength is increased by pressure. This increase is directly proportional to the amount of water squeezed out, making a reduction of the water-ratio.

output of the mixer, it affects the cost of the concrete. Consequently there is an unfortunate tendency to reduce the time of mixing, a practice which cannot be too severely condemned, because it results in a material loss in the strength of the concrete, and a lack of uniformity. Exhaustive tests made on concrete mixed in a batch mixer from 15 seconds to 10 minutes, show a rapid increase in strength for the first minute, and a slightly smaller increase for the second minute, after which the increase in strength is less pronounced as the time of mixing increases. This shows the necessity of mixing the concrete at least 60 seconds after all the ingredients, including the water, have been placed in the drum of the mixer, and not 20 to 40 seconds only, as is often done in road and street construction. There is no question as to the advisability of using a batch meter on the mixer, provided one can be found that cannot be tampered with, in order to avoid controversy over the time of mixing and to insure a full minute mix. When a mixer is manufactured that will not permit discharge until a certain number of revolutions have been made at a certain speed this problem will have been solved.

The revolutions per minute of the mixer within the limits of 12 to 25 R. P. M. have but little effect on the strength of the concrete, so that a sufficiently wide variation for different machines is permitted. In making tests of the effect of R. P. M. on concrete the total time was one minute in all cases, and all materials, including water, were placed in the drum before the time interval was counted.

The effect of pressure on concrete immediately after moulding is found to be due to the amount of water squeezed out, making a consequent reduction of the water-ratio. Tests were made on concrete of the same proportions, by applying pressure from zero to 500 lb. per sq. in. The water expelled was carefully collected and measured. It was found the strength increased quite materially with the higher pressures and this increased strength was almost directly proportional to the amount of water squeezed out.

It is not surprising to find, then, that the duration of the pressure had no effect whatever on the strength of the concrete. Whether pressure was applied for a few minutes or for several hours the effect produced was exactly the same. It is undoubtedly the squeezing out of the water and consequent reduction of water-ratio that produces the

excellent results when the roller method of finishing concrete roads is used.

The time that can be allowed between the time of mixing and the time of placing has not as yet been made the subject of extensive tests at the laboratory. This knowledge will be of value when considered in conjunction with central mixing plants, which are used with success in many places. The time which may elapse between mixing and placing without injury to the concrete is probably governed to a certain extent by the kind of cement used, by the temperature of the mixed concrete, by the nature of the vehicle and the road over which the mixture is hauled. In Illinois a limit of 40 minutes lapsed time is allowed, but it is generally believed that the economical haul for the job will be the governing factor rather than the fixing of a time limit.

It is possible that some of the present ideas regarding this factor may be changed by the results of a series of laboratory tests, but until such a time it would not be advisable to allow re-tempering of concrete that has been too long in transit, as the addition of water will no doubt result in a reduction in strength.

#### Protection

The proper protection of concrete during the early hardening period is a detail of construction that is too often overlooked and many times only indifferently carried out. The effect of proper curing conditions upon the ability of the concrete to withstand abrasion has been very strongly brought out by numerous tests in the laboratory. There is probably no factor in the handling of concrete that so affects its wearing ability, as that of providing proper protection while curing or hardening.

It is true that any and all of the factors that tend to produce strength in concrete also tend to increase its wearing qualities; nevertheless all of our tests show that other factors being the same, the concrete which is properly protected will show much more compressive strength and much less wear than that which has been allowed to dry out too quickly. As an illustration of this, at the end of four months the compressive strength of a concrete of 1:2:5 consistency was about 1,700 lbs. per sq. in. when it was allowed to dry out in the air unprotected, while exactly the same concrete stored in damp sand for the first 21 days



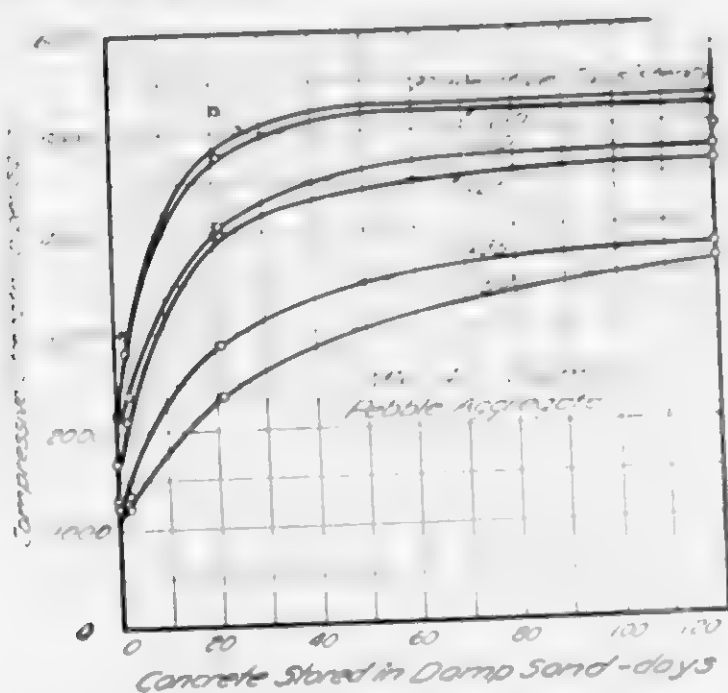


Fig. 10. Effect of Proper Protection During the Early Hardening Period Upon the Compressive Strength of Concrete

Note that the greater effect is on the drier consistencies, but that even the wetter consistencies are more than doubled in strength by proper curing conditions during first 21 days.

gave a compressive strength of about 4,000 lbs. per sq. in. and a correspondingly less wear in the rattler test.

One of the principal causes of the poor wearing resistance that is sometimes found in concrete floors is due to the practice of allowing them to dry out without proper protection during the hardening period. Concrete floors under roof should be covered and kept moist just as outside roads and pavements are protected. Why throw away one half of the life of concrete floors by failing to observe this rule and holding back from using them for so short a period?

The essential requirements for proper hardening are

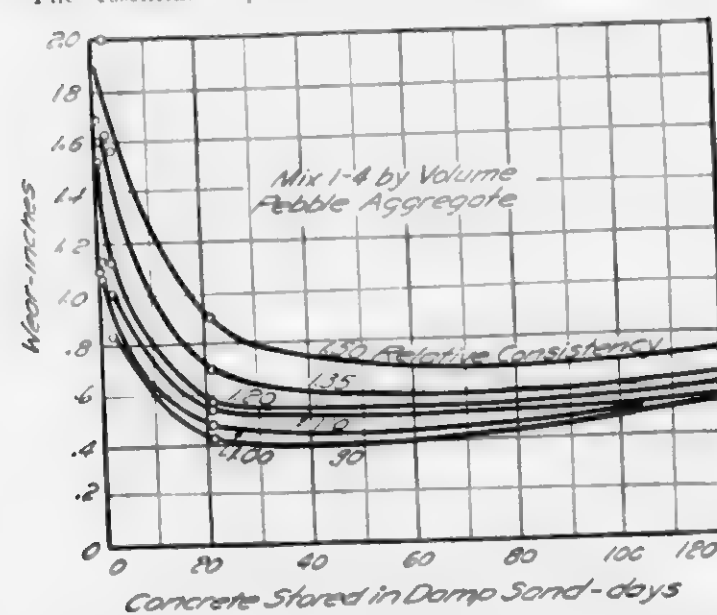


Fig. 11. Effect of Proper Protection During the Early Hardening Period Upon the Resistance to Wear of Concrete

Note that the greater effect is on the wetter consistencies, but that the wearing qualities of the drier consistencies is doubled by proper curing conditions during first 21 days.

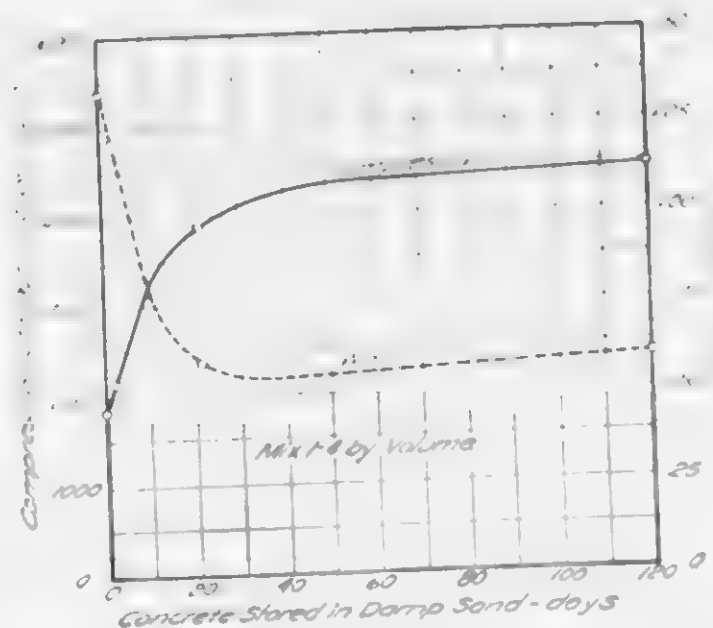


Fig. 12. Effect of Proper Protection During the Early Hardening Period Upon the Compressive Strength and Resistance to Wear of Concrete

Note that these curves are practically the opposite of each other, viz., the resistance to wear decreases, as the compressive strength increases.

warineth and the presence of moisture, especially the latter. The tests show a nearly constant rate of increase in compressive strength and resistance to wear during the first 21 days of proper protection, after which the rate of increase gradually falls off. In deciding on the length of time that a pavement, or other structure, shall be kept covered and moist, it is simply a matter of deciding how much of the potential strength and wear resistance it is desirable to throw away, and reducing the 21 day period by that amount.

There are several methods of protecting concrete pavements and floors during the early hardening period, the most effective of which is the ponding method, and where the grades and other conditions will permit this method to be used, it will give the best results. The protection of concrete structures other than pavements is very often either neglected altogether or at best only half carried out. Many times the leaving on of the forms is considered to be sufficient protection in itself, but this is not so. The forms and all exposed surfaces should be kept thoroughly wet, or at least very moist, continuously for not less than 14 days, and whenever possible for 21 days or more.

#### Conclusion

Some of the more important developments resulting from the studies at the laboratory have been outlined herein, with two objects in view: First, to bring out the advisability of designing each concrete mixture to produce a concrete of a certain desired strength, with the particular ingredients available, and, second, to call attention to, and emphasize the important features in the making of good concrete.

In reviewing the methods to be employed in obtaining good concrete there are two points which stand out above all others, and if these are followed more good will have been done than by following all other refinements put together. The first of these is, that the least amount of mixing water shall be used that will give a workable mix, and not one drop more. The second is: that no matter with what care the ingredients are chosen, proportioned, mixed and placed, a considerable portion of the beneficial results of this care will be nullified unless the concrete is kept moist during the early hardening period.

September, 1921.

TABLE I  
Twelve Sieve Tests of Bennett Gravel. Each taken from a different shipment on the shipping trucks  
Season of 1920  
% Passing

Sieve	3/4"	3/8"	5/8"	1 1/4"	1 1/2"	2"	3"	4 1/2"	6"	10"	18"	30"	48"	60"
1	100	100	100	100	97	94	88	74	60	48	38	28	18	10
2	100	100	100	100	97	94	88	74	60	48	38	28	18	10
3	100	100	100	100	97	94	88	74	60	48	38	28	18	10
4	100	100	100	100	97	94	88	74	60	48	38	28	18	10
5	100	100	100	100	97	94	88	74	60	48	38	28	18	10
6	100	100	100	100	97	94	88	74	60	48	38	28	18	10
7	100	100	100	100	97	94	88	74	60	48	38	28	18	10
8	100	100	100	100	97	94	88	74	60	48	38	28	18	10
9	100	100	100	100	97	94	88	74	60	48	38	28	18	10
10	100	100	100	100	97	94	88	74	60	48	38	28	18	10
11	100	100	100	100	97	94	88	74	60	48	38	28	18	10
12	100	100	100	100	97	94	88	74	60	48	38	28	18	10

## Merits of Fine Gravel as Coarse Aggregate in Concrete for Roads

By John M. Braly, Bennett Gravel Co., Spring Lake, N. J.

By "Fine Gravel" is meant one which practically all passes the 1 1/2 inch and is caught by the 1/2 inch sieve. About 90% passes the 1/2 inch sieve and about 25% lies below the 1/4 inch sieve. Its habitat is New Jersey south of the Raritan River and it is often spoken of as "South Jersey Gravel". It is practically all quartz. It makes the best and cheapest coarse aggregate available for concrete construction over large areas of the State.

In order to illustrate the physical properties of Fine Gravel, Table I is given. This table gives the sieve analysis of 12 samples, each taken from a carload after the car had been placed for shipment on the day designated. The samples were taken during the season of 1920 at the works of the Bennett Gravel Company. The product includes the whole run of the bank between the 1/2 and the 1/4 inch sieves. No effort was made to control the intermediate gradings. The samples were secured by taking 1/2 a cubic foot of gravel from three places in each car, one near the middle and one near each end. The three were mixed and 1/2 a cubic foot taken from the mass. The sieve test was made with the 1/2 cubic foot so secured. Each sample was weighed as a whole before sieving. From the weights so obtained the percentage of voids were calculated in the usual manner, but the sample was not dried. The weighing of the test sample usually took place several hours after the sample was taken and it was so done because the material would be at the time in the condition as when going actually into the work.

TABLE II  
Average, Maximum and Minimum Percentage Passing Each Sieve

Sieve	Average	Maximum	Minimum
1 1/2"	99	100	97
3/4"	79	94	48
3/8"	31	58	5
1/4"	5	10	1

Table II gives the maximum, minimum and average percentage passing each sieve from which it will be seen that the grading varied widely.

Table III gives the fineness modulus of each test and the cumulative average for the series, determined according to the method used by Prof. Abrams in work at the Lewis Institute.

Table IV shows nine (9) crushing tests made on sample cubes from a State aid job in the Borough of Rumson in Monmouth County, New Jersey, built in 1919.

Table V shows eighteen (18) tests on cubes from a job in the Borough of Spring Lake, built in 1921.

Table VI shows tests on three (3) cubes made with Fine Gravel and three (3) with Pennington Trap Rock. The Rumson cubes were made on the job. The Spring Lake cubes likewise. The cubes in Table VI were made in the State Laboratory and all cubes were broken there on the dates and at the ages indicated.

The Rumson and Spring Lake roads were concrete base and bituminous top. The gravel and sand for both these jobs came from the Bennett Plant and the methods of preparation as well as the raw material were precisely the same during the years 1916 and 1921 inclusive as they were in 1920 when data for Tables I, II and III were obtained.

After the Spring Lake tests were completed, consultation with the Laboratory developed the idea that perhaps a more uniform strength could be obtained if a portion of

the minus 1/2 inch product were taken out and the necessary changes were made at the plant to limit the minus 1/2 inch to not over 25%. No tests are yet available by which to judge whether any improvement was made, but the plant is now equipped to limit the minus 1/2 inch to 25% or any other desired quantity.

For usual mixtures the bulk of the mortar content exceeds the bulk of the voids in the coarse aggregate unless the voids are thrown out of line by violent fluctuations in the grading.

To control grading between narrow limits costs money and it is to the distinct advantage of fine gravel that the control is much less expensive than crushed aggregates.

Control of grading is really control of void content, or its reciprocal, absolute solid content. Incidentally this is a good place to suggest that if the proportioning were done by weight instead of by measure there would be no particular need to control grading except as to Maxima and Minima.

But so long as proportioning by measured volume of loose materials obtains, it is interesting to know that with fine gravel the fluctuations in grading have so little influence on the void content and the Fineness Modulus that the run of the bank will usually furnish, between the limiting sieves, a product in which the variation of the void content is so small even when the variations in grading are very great, that the bulk of the mortar always exceeds the bulk of the voids in the coarse aggregate. See Tables I, II and III.

The significance of this fact is of much importance. It means that the actual handling of fine gravel from plant to job leaves it in such condition when used that any tendency it may have to segregate can be ignored and

TABLE III  
Fineness Modulus—Weight Per Cubic Foot and Percentage of Voids in Fine Gravel

Date	Fineness Modulus	Weight per Cubic Foot	Percentage of Voids
1920			
May 4	6.68	98	41.11
8	6.65	102	38.0
13	6.66	99	40.0
17	6.41	104	36.9
June 11	6.58	99	40.0
22	6.80	102	37.2
26	6.70	97	41.0
July 10	6.81	100	39.4
27	7.02	101	38.6
Aug. 21	7.46	98	40.6
Sept. 11	7.18	103	37.5
	7.13	105	36.4

that any extra expense incurred in the effort to reform the grading is not justified by the results obtained.

Tables IV and V support the statement. The fine gravel used in both these jobs was precisely the same product as that from which the samples were taken to produce Tables I, II and III. The average strength accomplished with 1:3:5 concrete at 28 days averaged 3391 pounds per square inch, and 1:2:4 at the same age averaged 4733 pounds per square inch.

Since anything over 2000 pounds per square inch is abundantly sufficient for the purpose (base for bituminous pavement) it is clearly good business to use fine gravel whenever and wherever its cost is equal to or less than any other aggregate.

TABLE IV  
Six Inch Concrete Cubes—Rumson Road  
Proportions 1:2:4

Cube	Made-1919	Age	Crushing Loads in lbs. per sq. in.
1	4-14-19	7	3750
2	4-14-19	7	3770
3	4-14-19	7	3760
4	4-13-19	28	4980
5	4-13-19	28	4700
6	4-11-19	28	4580
7	5-26-19	7	2673
8	5-26-19	7	2900
9	5-26-19	7	2645
Average of 7 days—3233			
Average of 28 days—4753			

Table VI is the nearest we have to a comparison of fine gravel with broken stone. The tests are limited to three cubes of each and the mixture is different. Different sands were used as well as different cements.

The value of the comparison then amounts to this, that fine gravel is not inferior to trap rock as coarse aggregate. The ultimate strength of these six cubes was probably influenced more by the character of the mortar than by the mineral of the coarse aggregate but it will be interesting to know that the mortar was strong enough to shear some of the coarse aggregate in both sets of cubes, and that the shearing was about the same in both sets.

The discussion so far has been confined to concrete used as a base. What about single course concrete with surface exposed to traffic?

Table VII shows a number of pavements of this type with the years of construction, all using Fine Gravel. The Belmar, Red Bank and Bridgeton Pavements were constructed with gravel from Bennett's, none of them specially prepared but using the regular standard product of the plant as set forth in Table I.

The abrasive resistance has been excellent. In general, the abrasive resistance will depend more on the mortar than on the coarse aggregate. This is because in the con-

TABLE V  
Six Inch Concrete Cubes From Ocean Avenue,  
Spring Lake, N. J.  
Proportions 1:3:5

Cube	Made-1921	Age	Crushing Loads in lbs. per sq. in.
1	4-21-21	28	2773
2	4-26-21	28	2742
3	5-7-21	28	3284
4	5-9-21	28	3608
5	5-20-21	28	4150
6	5-25-21	28	3582
7	5-27-21	28	3764
8	5-28-21	28	3153
9	6-1-21	28	4673
10	6-2-21	28	4363
11	6-3-21	33	3478
12	6-7-21	29	2300
13	6-8-21	28	3810
14	6-9-21	28	3362
15	6-10-21	28	2325
16	6-11-21	28	3782
17	6-14-21	28	3419
18	6-16-21	28	2469
Average 3391			

struction activity the coarse aggregate is mostly forced down and away from the surface so that the first wear from the traffic comes on the mortar. The fine aggregate and the cement are of far greater importance in resisting abrasion than the coarse aggregate until such time as the top has been worn away until the coarse aggregate has been exposed. When that time arrives (and it will certainly arrive) it will be of great value to the pavement if the coarse aggregate is composed of a mineral of equal hardness and coefficient of wear as the grains of the fine aggregate; for then will the wear act on the coarse aggregate and the surrounding mortar with equal speed and the pavement will continue to present an even surface the same as when it was new and may

TABLE VI  
Concrete Cubes  
Broken May 12, 1919—Age 28 days

No.	Mix	Sand	Coarse Aggregate	Cement	Loads in lbs. per sq. in.
1	1:2:4	Bennett	Fine Gravel	Dragon	4980
2	1:2:4	Bennett	Fine Gravel	Dragon	4700
3	1:2:4	Bennett	Fine Gravel	Dragon	4580
4	1:2:3	Tullytown	Trap Rock	Atlas	4610
5	1:2:3	Tullytown	Trap Rock	Atlas	4650
6	1:2:3	Tullytown	Trap Rock	Atlas	4600
Average 1, 2 and 3					4753
Average 4, 5 and 6					4617

thus be kept in service until the last available sixteenth of an inch of the wearing portion has been used up.

On the contrary, note what will happen if the coarse aggregate is of a different degree of hardness than the fine. If softer, holes or depressions will begin to appear and maintenance to climb up. If harder, then the mortar will begin to wear away from around the larger pieces leaving them projecting above the surface, as islands of cursed ness for which there has not yet been a remedy discovered.

Now practically all the sand available in New Jersey is of silica. Fine Gravel is of silica. Q. E. D.

The advantage of equal abrasive resistance possessed by fine gravel is not due to its size but to the fact that it is all quartz. Coarse gravel is mostly of glacial origin and contains rocks of every kind and degree of hardness, from

TABLE VII  
Concrete Roads and Streets  
Built With Fine Gravel

Name and Location of Road or Street	Miles	Sq. Yds.	Year
1 East Commerce Street, Bridgeton		3,400	1915
2 Adelphia, Freehold Road	1.00		1916
3 White Street, Red Bank		2,671	1916
4 F. Street, Belmar		15,000	1917
5 Water Street, Bridgeton		2,400	1918
6 South Laurel Street, Bridgeton		7,000	1919
7 Pennsgrove-Pennsville, 2d Sec.	0.886		1919
8 Bridge Avenue, Red Bank		3,740	1920
9 Pennsgrove-Pennsville, 3d Sec.	1.080		1920
10 Malaga-Pennsgrove, 4th Sec.	See No. 13		1920
11 Salem-Pennsville	0.975		1921
12 Pennsgrove-Pennsville, 4th Sec.	1.364		1921
13 Malaga-Pennsgrove, 5th Sec.	3.700		1921
14 State Highway Route 6, Sec. 7 Woodstown-Salem	3.987		1921

slate to basalt. Also, most of the deposits contain so much oversize that the operation of preparing the gravel is about as much a crusher proposition as it is a gravel one with corresponding forfeiture of certain merits set forth above.

To sum up then we have shown—

- That fine gravel makes concrete of strength equal to or superior to other aggregates.
- That it is plentiful in certain portions of the state.
- That the grading to obtain desired density is easily controlled and that even when not controlled at all, it has produced satisfactory results.
- That its abrasive coefficient is correct for use with Jersey Sand and superior to anything yet offered for coarse aggregate in concrete surface type pavements.

We may safely conclude then, that by permitting fine gravel to compete on equal terms with other aggregates offered

- The best interests of the tax payers will be conserved.
- The available tonnage of road metal will be vastly increased.
- Transportation costs will be reduced and freight delays minimized.
- The quality of the pavements, especially the concrete surface type will be raised to the highest possible degree.



FIGURE 1—South Jersey Gravel. Left, grades same as sample No. 1 in Mr. Braly's Table I. Right, same as sample No. 2 in table referred to.

## Discussion of Mr. Braly's Paper

By Mr. J. G. Bragg, Senior Testing Engineer, New Jersey State Highway Department

Mr. Braly has presented a strong plea for the use of fine gravel aggregate and has shown that it does possess certain merits, chief of which are its plentifulness in portions of our State, the use of which will increase the available tonnage of road metal, and in some cases reduce transportation costs and minimize freight delays. He has, however, undertaken to endow his material with certain merits which it cannot possibly possess.

First, let us consider what is generally accepted as an ideal concrete. Theoretically, we would start with a coarse aggregate, the largest size being not greater than one-third of the distance between reinforcing members or the smallest section to be filled with concrete. The voids in this stone are filled with the next largest size and this is continued until we have reached the smallest particles of sand, after which all remaining voids are filled and all particles of coarse and fine aggregates are coated with cement.

It must be remembered that in addition to the ingredients above mentioned, there is a fourth factor to be considered; namely, water. Add to the above just sufficient water to produce a workable mix and *no more*. The ultimate strength obtained is directly dependent upon this very important ingredient.

Now assuming a coarse and fine aggregate of exactly the same physical properties held firmly together by cement which has the same resistance to stress as the above mentioned aggregates, we have an absolutely homogeneous mass, uniform in character throughout. There are many ways by which we may attempt to attain this ideal, a few of which are—determination of voids, density of trial mixtures, gradation of aggregates, fineness modulus and surface area.

None of these methods produce the desired effect, yet they are all based upon correct assumptions. Many factors make the ideal concrete impossible of attainment, most of which have to do with construction details. Now, while the use of very large aggregate produces strong concrete, there is a practical limit on the size which may be used without undue segregation of the mortar and coarse aggregate. The fact that stronger concretes are obtained by the use of large aggregates has produced a growing tendency toward too large an aggregate. The upper limit on size, however, does not stop at one (1) inch merely because ninety (90) per cent of our South Jersey gravel is smaller than that, and we are no more justified in adopting generally an excessively fine aggregate that we are to go to extremes on large aggregates. If we do either, the producers of materials are to be congratulated upon their ability to crack jokes at the expense of the Engineering profession.

Mr. Braly makes the statement that to control grading between certain limits costs money. We do not dispute this fact; neither can there be any question of the value received for money thus expended. The control of grading between certain limits means more than the control of void content only. It controls also the accumulative surface area of coarse aggregate to be held together with a

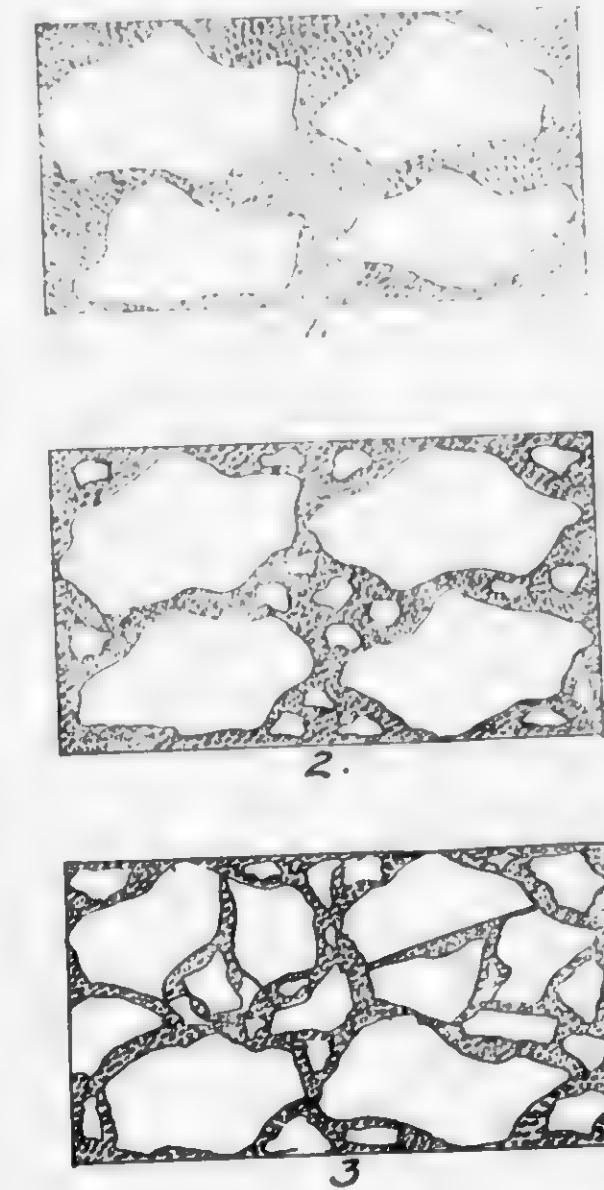


Figure 2—Character of concretes obtained with various gradings

- Coarse aggregate, all one size
- Poorly graded aggregate, showing effect of "robbing". Large and small particles of coarse aggregate with no intermediate sizes.
- Properly graded from largest to smallest particles



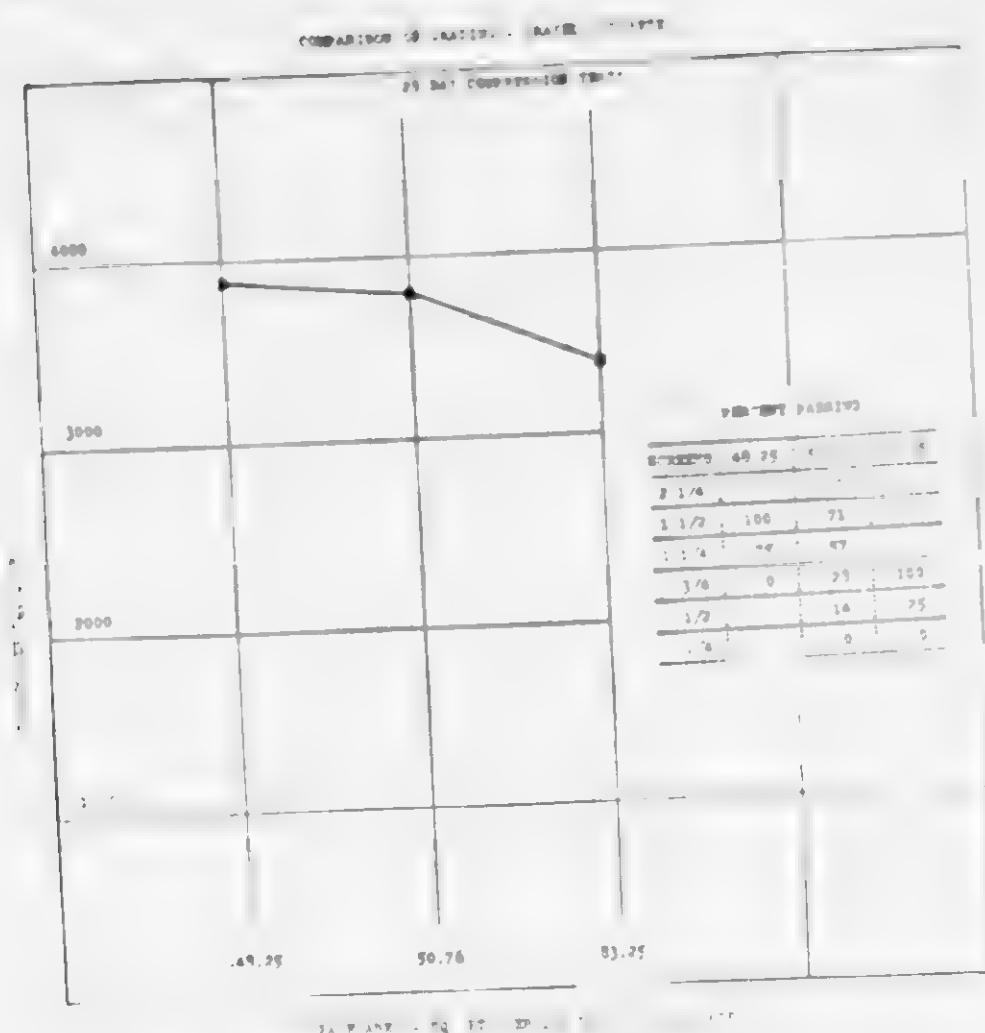


Figure C—Shows decrease in strength with increase in surface area of coarse aggregate

unit quantity of cement, and since any change in surface area makes necessary a change in the amount of water used, grading control aids in the production of a concrete having the very important element of uniformity.

Without proper control of grading it is practically impossible to specify proportions in any manner which will result in a concrete of generally satisfactory quality. The differences in grading as shown in Mr. Braly's tables produces differences in void content sufficiently large to change his actual proportions from the specified 1:2:3.5 to 1:3:5. The surface area of his material varies from 56 to 106 square feet per 100 pounds.

TABLE NO. 1

Variations in Cement Content Due to Variations in Per Cent Voids.

Mr. Braly's Table III shows variations of approximately 5% Proportions 1:3:5

Per Cent Voids	Bags Cement Per Cu. Yd.	Shortage in 6 Inch Slab 50 Feet Long
40	4.44	
35	4.24	4 Bags

TABLE NO. 2

Change in Proportions to Allow For 5% Variations in Voids.

Per Cent Voids	Specified Cement Content	Proportions	Actual Cement Content Per Cu. Yd.
40	4.44	1:3:5	4.44
35		1:2:3.5	4.52
		1:3:4.1	4.52

TABLE NO. 3  
Surface Area Comparison  
Of Gravels From Mr. Braly's Table I.

Sample	Per Cent Voids	Surface Area Per 100 Pounds Of Aggregate
5/13	36.9	106.12
7/27	40.6	56.22

Time is not available to go into detail relative to the strengths secured with the use of fine gravel. It can be said, however, that when properly proportioned and properly prepared, satisfactory strengths are obtained. Mr. Braly has made certain statements, relative to the wear coefficient of South Jersey gravels which warrant the presentation of a few facts. He says in effect that both fine and coarse aggregates should have equal wear resisting properties and since South Jersey gravel and South Jersey sand are both composed of Silica—Q. E. D. As you know, Q. E. D. means "thus it is proven", and we propose to disprove his theory P. D. Q.—which means just what you think it means.

Last winter we made some wear comparisons of sands and gravels from different producers. It is natural to assume that some definite relation would exist between the wearing qualities of gravel and sand from the same deposit. We find, however, that in one deposit, in which the gravel shows eight (8) per cent wear, the sand shows nearly four (4) per cent. In another deposit the gravel shows thirty (30) per cent. wear and the sand less than two (2) per cent. Here we have one gravel showing only one-quarter as much wear as the other, but the sand from that deposit shows nearly twice as much wear as the sand from the second deposit. We find, also, that when made into concrete the strength of both aggregates is highest when the sand showing least wear is used, and lowest when the sand showing the most wear is used. In a general way, it may be said that the wearing quality of concrete is dependent upon its strength properties, that is, a concrete having a high compressive strength will have a relatively high resistance to abrasion.

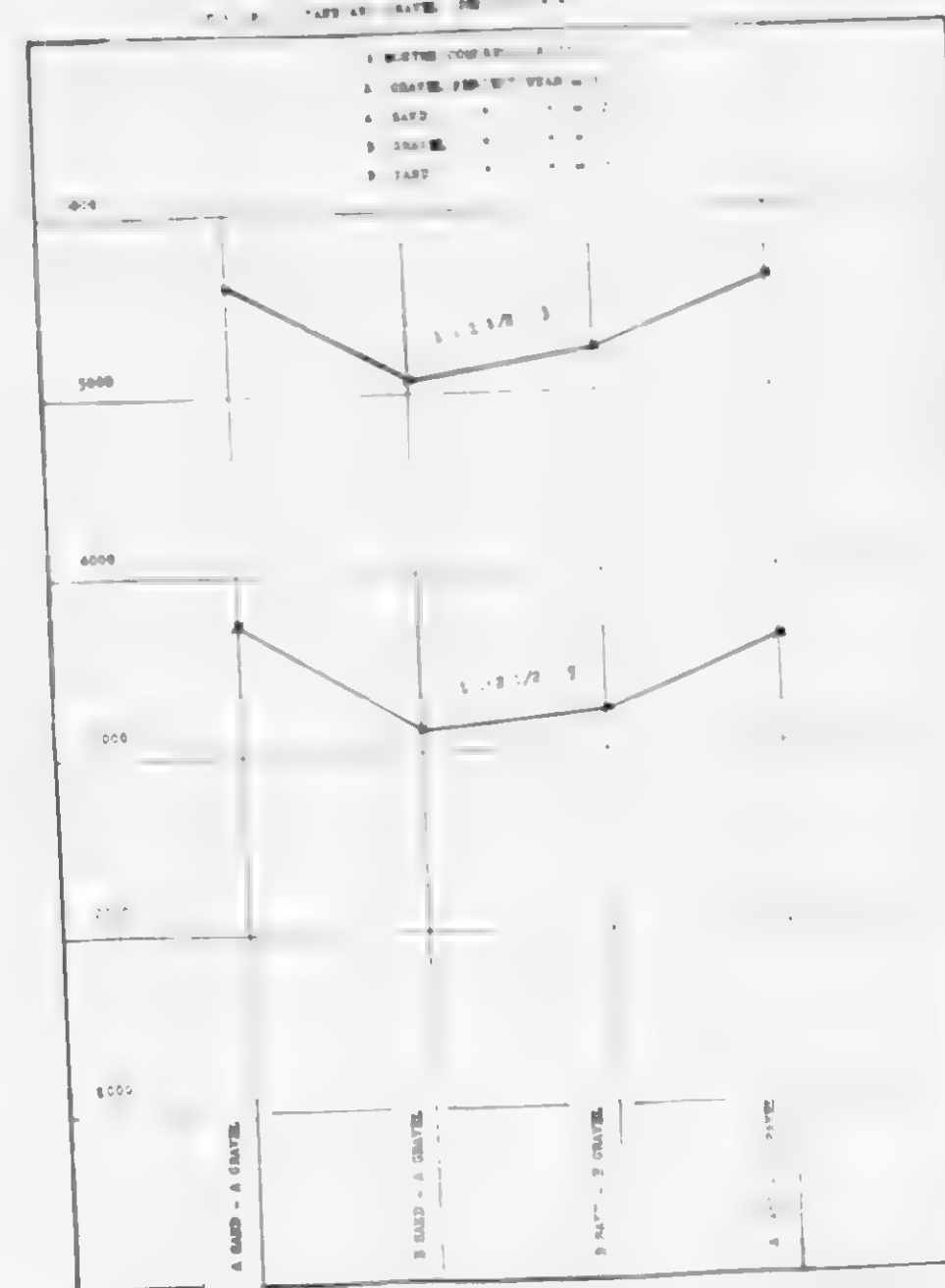


Figure D—Showing strengths obtained with various combinations of sand and gravel from deposits A and B

We can admit then that South Jersey sand and South Jersey gravel are both of Silica composition, but the inference that their use will produce a concrete of uniform wearing qualities is indicative of guess work only.

Some mention is also made of the so-called Islands of Cussedness caused by the use in concrete pavements of a coarse aggregate having a greater degree of hardness than the fine aggregate. We have heard this phase of wear on concrete mentioned before, and perhaps somewhere such a condition exists, but we must all admit the paucity of information directing us to a pavement which shows the action described. No doubt those who have advanced this theory are sincere in their beliefs, but I feel that these Islands of Cussedness are encountered only by those who are at sea with their theories.

It is not meant to imply in this discussion that fine gravel aggregate has no place in the construction of good roads. It can be used to very good advantage in certain localities, but when so used it must be uniformly graded, and some allowance must be made for discrepancies in its potential concrete making value.

I will answer the summations of Mr. Braly's paper as follows: To the statement that "fine gravel makes concrete of strength equal to or superior to other aggregates," I will say that, given other aggregates of the same physical

properties a well graded coarse aggregate is always superior. That fine gravel is plentiful in certain portions of the State is admitted. I will admit also the ease with which the grading can be controlled, but I would state further that the place to control this grading is in the plant of the producer, and it is certain that when grading is not controlled, satisfactory results are very seldom secured in the field. To say that "the abrasive coefficient of South Jersey gravel is correct for use with Jersey sand and superior to anything yet offered as coarse aggregate in concrete surface type pavements" is absurd. It is also absurd to say that "by permitting fine gravel to compete on equal terms with other aggregates offered, the best interests of the tax payers will be observed and the quality of the pavements, especially the concrete surface type, will be raised to the highest possible degree." Such statements are usually made by those who have something to sell and are not based on conservative engineering practice or theory. The best interests of the tax payers are served when we use the best material obtainable which may be procured at a reasonable cost. Now, the fine gravel of South Jersey has been, and no doubt will continue to be, economically employed in the building of our roads; but fine gravels cannot hope to compete on equal terms with better aggregates.

## Merits of Fine Gravel as Coarse Aggregate in Concrete for Roads General Discussion at the Convention

COL. WHITTEMORE: There certainly must be some questions on this interesting subject.

MR. CRAWLEY: I would like to ask Mr. Bragg a question. In one of the diagrams he shows a change in the grading of the aggregates in getting the same class of concrete in two different ways, one by changing the large aggregate and one by changing the sand. Is there any difference between adding more of the large aggregate or adding more of the sand?

MR. BRAGG: That depends very largely upon the way your concrete works. With a gravel aggregate, similar to Mr. Braly's material, you could probably reduce the sand. What I meant was that, if possible, you should go on the sand rather than on the coarse aggregate. Gravel works easier usually than a harsher, more angular aggregate.

MR. CRAWLEY: Which will give the strongest test, increasing the sand or the stone?

MR. BRAGG: Decreasing the sand gives higher strength, but you will not always get the most workable mix by this method.

MR. HOWARD: The use of gravel for concrete base in foundations and pavements has been in use for 150 years. Scientists can be consulted and you will find provisions for gravel concrete. You will find that the city of Paris, with its solid streets, Berlin and Geneva, Switzerland, also, all of them use gravel aggregate for foundations of all kinds of pavements. Paris takes its gravel from the Seine. Keep the cement content down to the minimum to keep the particles together. We all recognize that by grading the gravel from the coarser down to the fines then putting in sand with cement, that you construct a mixture which is plastic, workable, and efficient. In Glasgow they require crushed granite graded with Portland cement, mixed into a solid mass.

MR. GAGE: In further reference to the best method to follow in designing or correcting concrete mixtures, I will state that the impression I received from the papers just read was that the strength and general value of concrete depend much more on the character of the mortar than the aggregate. Such being the case, I would like to ask Mr. Bragg if the strength of concrete in general is not improved more by decreasing the sand content than the stone.

MR. BRAGG: The quality of the concrete is improved by keeping as near as you can to the graded aggregate shown in the chart. A well graded mixture, all the way down from the biggest stone to the smallest particle should not require any change of proportion. If, however, a change is necessary and you merely cut down on the stone you will increase the proportion of mortar and you are bound to decrease the relative strength of your concrete as compared with concrete in which the sand was reduced. If you can secure the cement content by reducing the sand and still have a workable mix, that is the thing to do, but there is a point beyond which you cannot go and retain a workable mix. Not enough mortar to carry your stone will make a harsh working mix. Trying to increase the cement content by reducing the sand only, will sometimes produce a mixture which works very hard, making it very difficult to handle simply due to the fact that you have not enough mortar to slightly more than fill the voids in the coarse aggregate.

MR. BRALY: I would like to ask a question relative to the qualities of sand and gravel which Mr. Bragg mentioned. How does he arrive at the co-efficient of wear?

MR. BRAGG: Practically the same method is used in both cases. The same machine is used in determining the per cent. of wear on gravel as on sand. The methods vary, however, due to the fact that the particles of sand are very much smaller than gravel and the test has to be made on a smaller scale. For determining the per cent of wear on gravel, a sample consisting of certain sizes and weighing

one cubic foot, is used. The wear is determined by passing the sample through a series of sieves of increasing size. The per cent wear is calculated from the difference in weight between the original sample and the residue. The same method is used in determining the wear of sand. The difference in weight between the original sample and the residue is calculated from the difference in weight between the original sample and the residue.

MR. BRALY: That explains it very clearly, and I think I can say that that agrees very much with what I said. However, I may have created the impression that I guessed at the basis for the statement I made that wear between South Jersey gravel and the mortar which surrounds it is entirely uniform. I did not guess it that, and regret very much that I cannot show you photographs, but I can mention to you F Street, Belmar, where the pavement has begun to wear and the whole appearance is just like glass. It is so smooth, so I still stick to what I stated, that I believe it is a fact that coarse aggregate will wear uniformly with the mortar. This is to be determined by actual use in the work.

MR. BRAGG: That is one of the usual statements that the Laboratory has to meet; i. e., laboratory tests are not practical. You do not have to go to Belmar to see the action described by Mr. Braly. We have a sample of concrete in the Laboratory showing exactly the same action taken from Bellevue Avenue, Hammonton. I do not know how I can explain any clearer what I was getting at. I wanted to show that you cannot say that because sand and gravel come from the same deposit they will have the same wearing qualities. They distinctly do not have, and our tests prove it conclusively. There is no way to prove this do have, no matter how tests are made, whether the tests compare with field conditions or whether they are compared among themselves. The sample of concrete which we have in the Laboratory shows exactly what Mr. Braly brought out and also disproves one of the things claimed against gravel aggregate; that it will spall out of the surface. This gravel has not spalled out of the surface although subject to rather severe traffic for five or six years carrying the White Horse Pike traffic to Atlantic City, before the present Route No. 3 was adopted through Hammonton. I was not trying to say that the sand and gravel of Mr. Braly's won't wear, I was trying to say that the mere fact that they are both of silica composition is not an indication of their physical properties. When these aggregates are properly graded and proportioned, a pavement of good wearing qualities should be obtained.

MR. ALDRICH: I would like to ask Mr. Bragg a question relative to spalling out of the surface. I would like to know whether any comparative tests have been made on samples taken from actual jobs as to disintegration or spalling out of the surface because it seems, from the practical standpoint, that the gravel, working a little smoother than broken stone, would probably give you, under practical conditions, a slightly more dense sample.

MR. BRAGG: Our wear tests made on 5 in. x 8 in. x 8 in. specimens of concrete, show no greater spalling for gravel than for stone. Density of the concrete is dependent upon grading, mixing, water and proper tamping and I would not say that either aggregate has the advantage in that respect.

MR. MANSER: I would like to say for Mr. Braly's benefit, and from observation of the road you speak of, White Street, that I happened to be the builder, and at that time had just built a trap rock road, and had some material left over. I was allowed by the Engineer to build the first block with trap rock with exactly the same mix as the gravel. That was in 1915, and from observations,—one inspection as recently as two or three weeks ago—there has been no difference in the wearing qualities. No cracks have appeared. One is standing up as well as the other.

COL. WHITTEMORE: I might refer again to some of my former experience. I believe you have in mind, but did

I state that it is almost always subject to the wear of the traffic. I have seen with the same defect, a concrete pavement that was cracked in the traffic, and it was cracked with material, and it was cracked with material. The gravel was shown to be better than the rest of the tests. The concrete with the trap rock, just this morning, when the traffic started to come, it cracked and it was removed, was removed with trap rock. That was one kind of traffic, but it brings out the destructive effect of the traffic, which some States will not permit.

MR. BRALY: What year was that pavement put in?

COL. WHITTEMORE: I think it was somewhere about 1904 or 1905.

MR. BRALY: Was the gravel clean, prepared in a proper plant?

COL. WHITTEMORE: It was commercially clean gravel brought by scow.

MR. BRALY: The reason I asked was because it sounds like dirty gravel.

MR. GAGE: In further reference to the spalling or weathering of coarse aggregate used in concrete, I would like to refer to the Albany Post Road. It was reported that these holes were caused in this road by the use of a soft limestone, which had shattered or weathered and forced out of the pavement by traffic. Some of these holes were carefully examined by me and it was found that the material that was originally used in these openings was a mica soapstone. The quarry from which the aggregate was secured was then examined and it was found that there was a seam of this soapstone in the quarry which was directly responsible for the holes in the pavement. Many of the concrete roads constructed around Chicago and in Minnesota have these same defects. In this case, they are caused by the gravel containing a soft, unstable slate, which quickly weathers and wears out and cannot be separated from the aggregate except at considerable expense.

The most remarkable thing about these occurrences is, all statements to the contrary, that the edges of the concrete around these small openings have not broken, neither have they in any other way damaged the concrete except from appearance, yet some of these roads have been down from six to eight years.

In regard to the wearing properties of concrete or the aggregates used therein, I believe that we are not justified in the expenditures required to determine this quality of an

aggregate only to a limited extent. For personally I have never seen or do not know of a concrete pavement that is wearing out, and I have only known of one or two concrete bases where loaded trucks have broken through them. I can't see why we would put so much stress on the wearing properties of concrete when there is very little likelihood of failure in this respect when there are several other factors that do affect these pavements, such as the quality of the material. If these pavements can be held together so that they will not crack, ravel and go to pieces, I feel perfectly safe in saying that we need not worry about their wearing into ruts or holes.

MR. BRALY: I have never seen a concrete pavement where the mortar has worn out around the stone. I have seen it, but it is because of soft particles in the concrete, however, I would say a concrete pavement will last until it is broken up from other causes and will never wear out.

COL. WHITTEMORE: I have seen wear of traffic in and out of a building, confined to a 12-foot doorway. Most of the loads were going in, carried on steel tired trucks. Standard load was seven tons; the wagon and horses weighed two tons. The traffic was evidenced by a space 12 to 13 inches wide on each side, where the wagon wheels passed, for a length of about four feet inside the doorway and outside. Then the depression, about 5/8 of an inch, which was due to wear, disappeared because the traffic spread. One of the piers went out of business due to war conditions, and I inspected the site recently. They were cutting out this wheel track with chisels and hand hammers to remove the depression. This was entirely due to steel tired, heavily loaded trucks, and, since they are practically non-existent at present, I do not think you will find much wear due to localized traffic, if other conditions are kept from being the destroying factors.

MR. MOORE: Mr. Braly made a statement of the wear as shown on a Belmar pavement where his product was used. I would like to know if he has any reliable information as to what depth it is wearing. The statement was made to me that that surface is wearing considerably, that during the last 5 or 6 years the entire surface has worn, in some places to the extent that the reinforcement is showing. Are there any reliable measurements to show if the wear is to that extent?

MR. BRALY: No. The sand used was rather fine, which did not make the best mortar. The north end was built with materials from another plant, where not always the best results were obtained in washing. When speaking of it, I referred to the portion built with properly washed material, and would say that on the south end, where proper materials were used, there is practically no wear.





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in New Jersey**

May, 1922  
Vol. I  
No. 10

## Good Roads

### What Do They Mean in Your Young Life?

The term "good roads" is an old term, but it has taken on a new meaning. With the advent of the railroads, it looked for a time as tho the other roads would become of secondary importance—that their work would be confined to "feeding" the railroads.

All that has changed. The advent of modern motor transportation, and with it, the development of the permanent, always travelable, hard-surfaced highway, has again made ROADS of prime importance. It is not exaggerating to say that at present we could get along better without our railroads than without our modern "good roads" systems;—though, of course, we need them *both*.

Put in a nut-shell, there are just two big reasons why good roads are so all-important:

The first is, that the only thing in the world which is absolutely limited is *TIME*.

The second is, that *good roads* are the greatest savers of *TIME* that man has ever invented.

That is where they hit YOU.

Your production, your income, your pleasures, your achievements are all measured and limited by *TIME*.

Just stop a moment and figure up the amount of time that you spend—*waste*—in getting from place to place.

Then the overwhelming importance of *good roads* becomes self apparent.

Be a booster for "good roads."

Make yourself familiar with what *good roads* really are.

Invest some of your *intelligence*, as well as your money (through taxes) in good roads—they are the greatest dividend payers the world has ever known.

*The Highwayman*



**BEFORE** (June 29,) 1921—and—**AFTER** (May 11,) 1922  
Not only on the "open roads", but also in towns and cities, have there been deplorable road conditions to remedy.  
(Route 4—Section 5; Red Bank-Etontown)

# The Highwayman of New Jersey

## The Highwayman

Published Monthly By The  
State Highway Department, at Trenton, N. J.

The HIGHWAYMAN will be sent free upon application  
to any citizen of New Jersey who is interested in  
More and Better Roads For New Jersey!

### THE HIGHWAYMAN

H. C. SHINN, Editor in Chief

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C. F. BEDWELL EDWARD E. REED  
CHAS. FISHER

Managing Editor  
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5th Vice President - - - - - WM. J. MCGOVERN, State Labor  
6th Vice President - - - - - H. D. ROBBINS, Construction  
Executive Secretary - - - - - EDWARD W. O'BRIEN

### Vandals of the Road

We have noticed that some of the warning signals  
placed along the State Highway System, and showing an  
intermittent flashing light, automatically controlled, have  
been intentionally broken.

Presumably the work of boys. And yet it is hard to  
conceive of the boy—even the "bad" boy who likes to  
"show off" to his companions—who would do damage of  
this kind if he gave a moment's thought to the result.

The destruction of one of these signals may easily be the  
direct cause of a serious accident—even death.

Wherever and whenever you come in contact with boys,  
teach them to have respect for the State's property.

And why not suggest to your local Boy Scouts that one  
of the good things they can do is to watch these warning  
signals, and report, with all the information they can get,  
any injury to them.

### NOTE

#### Supplement for May Omitted

Due to the spring season's pressure of road work in this  
office, it has been necessary to postpone the issuing of the  
next "Road-builder's Supplement" until next month. At  
that time, the following papers, with the discussions upon  
them, will be published: "Highways", by Hon. James H.  
MacDonald, Former State Highway Commissioner of  
Connecticut; and also "Precautions Necessary for the  
Proper Application of Glutrin to Gravel Roads", by Maurice  
R. Young, Contractor.



**Bill Wildblood**  
Purchase Clerk of the Department

"I am willing to buy it if —"

"Bill"—who was christened Robert William, though no  
body ever calls him that now—was also born in Trenton,  
in 1896.

His first work in life was testing rubber—which was  
better in those days than it is now. After attending the  
Trenton Public Schools, and later taking a Secretarial  
Course in Rider College, Bill again took up the rubber  
business, but only for a short time.

In the fall of 1913, he accepted a position with the  
Department of Conservation and Development (then  
known as the Geological Survey) and was assigned to the  
Laboratory. In connection with the Laboratory work Bill  
earned the distinction of being one of the first men to act  
as Material Inspector for the Highway Department.

In the fall of 1917 Bill was transferred to the Main  
Office of the Department in the capacity of Clerk-Stenog-  
rapher. In 1918 he served with the 7th Engineers Train-  
ing Regiment at Camp A. A. Humphreys, Virginia.

In the spring of 1919 Bill was appointed to the position  
of Assistant Business Agent which he retained until the  
position was abolished in the fall of 1920 at which time  
he was made Purchase Clerk.

This photograph of Bill was snapped during the New  
Jersey State Highway Convention and by the expression  
on Bill's face, we don't know whether he had his mind  
strictly on business, but from past experience we judge he  
was getting ready to say, "I am willing to buy it, if you  
get the Chief's O. K."

### Chinese Moving Graves for Road Builders

It may have been difficult in earlier years to get graves  
removed in China and doubtless is so today as regards  
certain graves, but in this respect as in others the condi-  
tions of China have materially changed within recent  
years. For instance, the road from Hantan to Tamingfu  
has only three curves in 47 miles, and the last 27 miles are  
without a curve. It would not be possible to run such a  
road anywhere in the great plains of China without strik-  
ing many graves. Yet the road was built without any  
trouble or delay. In Shantung, while the roads were being  
built, the standard rate of \$2, Mexican, was established as  
payment for a grave. The owner moved it and in this  
Province no delays were encountered on account of the  
graves.—Highway News Digest.

### County Engineers Please Note

The columns of the HIGHWAYMAN are open to you and  
we cordially invite you to write up the job or jobs in  
which you are particularly interested, either supplying the  
necessary photographs or advising the Department that you  
would like to have us take photographs of your work to  
accompany your article.

The reimbursement construction work will offer oppor-  
tunity for some excellent articles.



**Norman C. Applegate**  
Supervisor of Equipment, State Highway Dept.

Norman C. Applegate, better known as "Norm."

With the exception of eighteen months which he spent  
with the A. E. F., in the 303rd Engineers, Norm has been  
with the Highway Department since 1913—consecutively  
as Foreman, Superintendent of Construction, and Super-  
visor of Equipment.

Like several other of the boys, Norm is a Trentonite by  
birth. He became a resident here in 1889, and has remain-  
ed ever since.

He attended Trenton Public Schools and Carnegie Insti-  
tute and received his degree in Civil Engineering with the  
Class of 1908 at the latter institution.

He was connected with the Trenton Iron Company as  
Engineer-Draughtsman, and with the Eastburn Company  
as Superintendent of Construction on several jobs in New  
York, New Jersey, and Pennsylvania, for five years pre-  
vious to entering the employ of the State.

The photograph above was taken after Art Bullock and  
Harry Shinn had tried to convince him that an automo-  
bile jack would not work. You can readily see what sort  
of an argument Norman thought they were putting up.  
This is the same type of smile that greets all officials when  
they try to put something over on Norm.

### Spring Inspection Trip N. J. Association of County Engineers

The New Jersey Association of County Engineers will  
hold its Spring Inspection Trip on June 16th and 17th.  
The Association consisting of various County Engineers  
and their Assistants, will examine the methods of con-  
struction and materials used in the various counties and  
state road and bridge jobs, particularly in the Counties of  
Essex, Hudson, Bergen, Passaic, Morris, Warren, Hunter-  
don and Mercer.

Considerable interest is being taken in this inspection  
trip as the relative merits of different types of road pav-  
ements are now being keenly discussed.

The Members of the State Highway Commission and  
State Highway Engineer Wassor will be on the trip, and  
will discuss with the County Engineers the various types  
of improvements.

The Boards of Freeholders are requesting their engineers  
to make the trip as the examination of the different types  
of roads in the several counties, and the resulting discus-  
sion at the County Engineers' meeting, will tend to give  
new and broader ideas to each engineer.

The Engineers' meeting will be held on the evening of  
June 16th in the Karldon Hotel at Easton, Pa. The var-  
ious standing committees on specifications, bridges, etc.,  
have promised to submit interesting and instructive reports.

The Engineers will visit several of the cement mills in  
and around Easton, where the methods of manufacture  
and the merits of the different kinds of cement will be  
pointed out.

The party will assemble at the Robert Treat Hotel in  
Newark on June 16th, at 10.00 A. M. Daylight Saving

## NEW JERSEY STATE HIGHWAY DEPARTMENT

March 1st, 1922

### Executive

HON. EDWARD I. EDWARDS, Governor

The State Highway Commission

and

THOMAS I. WASSOR, State Highway Engineer

### ADMINISTRATION

A. LEE GROVER, Secretary and Chief Clerk

M. L. HOWELL, Chief Auditor and Accountant

CHAS. FISHER, Assistant Chief Clerk

MISS GRACE WILLIAMSON, Chief File Clerk

R. W. WILDBLOOD, Purchase Clerk

### CONSTRUCTION DIVISION

C. F. BEDWELL, Construction Engineer

G. R. MOORE, Asst. Construction Engineer

R. A. MEER, Right of Way Engineer

C. A. MEAD, Bridge Engineer

THOMAS GEORGE, Acting Supt. of State Labor

C. A. BURN, Northern Division Engineer

H. D. ROBBINS, Central Division Engineer

J. A. WILLIAMS, Southern Division Engineer

### MAINTENANCE, EQUIPMENT AND PROJECTS DIVISION

EDWARD E. REED, Assistant State Highway Engineer

A. W. MUIR, Superintendent of Maintenance

JACOB HAGIN, Superintendent of Plant and Equipment

N. C. APPLIGATE, Supervisor of Equipment

A. D. BULLOCK, Projects Engineer

H. C. SHINN, Engineer of Special Assignments

### TESTING LABORATORY

R. B. GAGE, Chemical Engineer

J. G. BRAGG, Senior Testing Engineer

F. H. BAUMANN, Senior Testing Chemist

Time. A detailed itinerary is now being prepared and  
will be sent out later.

The officers of the Association are:

HARRY F. HARRIS, County Engineer of Mercer, President

FRANK J. RADIGAN, Acting County Engineer of Hudson,

Secretary.

ROSCOE P. MCCLAVE, County Engineer of Bergen, Vice

President.

CHARWOOD FERGUSON, County Engineer of Passaic, Treas-  
urer.

### Memorandum for Next Issue of Highwayman

In order that the HIGHWAYMAN may be ready for dis-  
tribution by the first of each month, it has been decided  
to have bulk matter ready for the printer a month and  
ten days previous to publication date, and all photographs  
should be ready for the printer approximately a month  
and one-half in advance of the date of issue, that means  
that the photographs for the June Issue should be submit-  
ted to the Editor-in-Chief not later than the 12th of April  
and reading matter not later than the 20th of April.

In the handling of monthly publications where cuts and  
intricate arrangement are necessary, the matter for publi-  
cation is required sometimes three months in advance of  
the date of publication, so the HIGHWAYMAN is not requir-  
ing an excessive amount of time for the submission of  
matter for its publication.



## Contract News

### Roads to Be Built and Who Will Build Them

Prepared to April 19, 1922

Every user of roads is interested in where new roads are to go, and in their construction. If you are near one of these jobs, take the time to go and watch the road-builders at work—you'll find it time well spent.

Feb. 6, Route No. 6, Section No. 5, Shirley-Oldman's Creek, Concrete Paving Job, 6.812 miles, 20 feet wide with gravel shoulders, was awarded to the Benjamin Foster Company, Philadelphia, Pennsylvania, on his low bid of \$254,021.53.

Feb. 15—Route No. 6, Section No. 6, Old Man's Creek-Mullica Hill, Reinforced Concrete Paving Job, 5.028 miles, 20 feet wide with gravel shoulders, was awarded to the firm of M. Staub, Swedesboro, New Jersey, on his low bid of \$203,660.48.

Feb. 14—Route No. 2, Section No. 3, South Broad St., Storm Drain job was awarded to A. G. Thompson, of Trenton, New Jersey, on his low bid of \$17,665.06.

March 6—Route No. 6, Section No. 10, Quinton to Marlboro, Grading and Graveling job, 5.994 miles, 20 feet wide, was awarded to the Masterson Construction Corporation, New York City, on their low bid of \$79,793.17.

March 6—Route No. 6, Section No. 11, Salem to Quinton, Reinforced Concrete Paving Job, 2.648 miles, 20 feet wide with gravel shoulders was awarded to Joseph F. Burke, of Plainfield, New Jersey, on his low bid of \$111,833.79.

Feb. 27—Route 10, Section 1-B, Arcadian Way to Fort Lee Ferry, Reinforced Concrete Paving Job, 0.48 miles, 20 and 30 feet wide with earth shoulders, was awarded to the firm of John J. McGarry, Edgewater, New Jersey, on his low bid of \$104,362.61.

Feb. 21—Route 14, Section 5, Cape May Court House to Swainton, Concrete Paving Job, 2.987 miles, 20 feet wide with gravel shoulders, was awarded to the firm of Sutton and Corson, Ocean City, New Jersey, on their low bid of \$118,776.16.

March 8—Route 4, Section 9, Smithville-Mullica River, Warrenite Bithulithic Job, 3.748 miles, thirty feet wide, with gravel shoulders was awarded to C. H. Earle of Hackensack, New Jersey, on his low bid of \$374,533.77.

March 8—Route 4, Section 6, Eatontown-West Long Branch, Sheet Asphalt Job, 2.69 miles, 20 feet with earth shoulders was awarded to the Utility Construction Co. of New Brunswick, New Jersey, on their low bid of \$149,679.74.

Jan. 1—Route 6, Section 8, Pearl St., Bridgeton, Concrete Paving Job, 0.455 miles, 20 and 30 feet wide with gravel shoulders was awarded to the Tri-State Construction Company, Bridgeton, New Jersey, on their low bid of \$76,302.36.

April 5—Route 4, Section 10, Shadow Lawn-Roseld Ave. Sheet Asphalt Paving Job, 2.41 miles, 20 and 36 feet wide with earth shoulders, was awarded to Newark Paving Company of Newark, New Jersey, on their low bid of \$104,969.51.

April 4—Route 2, Section 3, South Broad Street, Sheet Asphalt Job, 0.648 miles, 48.5 feet wide, was awarded to J. J. Barrett, Trenton, New Jersey, on his low bid of \$69,433.77.

March 1—Route 11, Section 1, Main Street, Passaic, Sheet Asphalt Job, 0.257 miles, 40 feet wide, was awarded to Union Building Construction Company, Passaic, New Jersey, on their low bid of \$15,160.15.

April 5—Route 4, Section 12, Sea Girt Avenue, Concrete Paving Job, 0.162 miles, 20 feet wide with earth shoulders, was awarded to T. H. Riddle, New Brunswick, New Jersey, on his low bid of \$8,569.23.

April 4—Route 9, Section 6, Somerville-Bound Brook, Concrete Paving Job, 2.491 miles, 20 feet wide, earth

shoulders, was awarded to Salmon Brothers, Netcong, New Jersey, on their low bid of \$131,710.10.

March 31—Route 4, Section 5-A, Storm Drain in Red Bank was awarded to Chas. J. Romano, Montclair, New Jersey, on his low bid of \$15,314.85.

April 10—Route 6, Section 9, Salem-Collier's Run, Concrete Paving Job, 4.752 miles, 20 feet wide with gravel shoulders was awarded to Sampson & Reuter, Elizabeth, New Jersey, on their low bid of \$196,975.08.

April 18—Route 9, Section 5, Union Avenue, Bound Brook, Sheet Asphalt Job, 1.501 miles, 20 feet wide with earth shoulders was awarded to the Utility Construction Company of New Brunswick, New Jersey, on their low bid of \$93,090.31.

April 10—Route 3, Section 8, Camden-Clements Bridge Road, Concrete Paving Job, 3.82 miles, 36 and 40 feet with earth shoulders was awarded to W. Penn Corson, Ocean City, N. J., on his low bid of \$248,532.24.

April 10—Route 3, Section 9, Clements Bridge Road-Kirkwood, Concrete Paving Job, 3.756 miles, 29 feet wide with earth shoulders was awarded to John M. Kelley Construction Co., Camden, N. J., on their low bid of \$200,592.95.

April 10—Route 3, Section 10, Kirkwood-Berlin, Concrete Paving Job, 5.576 miles, 29 feet wide with earth shoulders, was awarded to John M. Kelley Construction Co., Camden, N. J., on their low bid of \$297,993.89.

April 14—Route 5, Section 5, Madison Ave., Morris Twp. & Borough of Madison, W. B. on Concrete base, 2.032 miles, 20 feet wide with earth shoulders, was awarded to the Northern Construction Company of Newark, New Jersey, on their low bid of \$117,444.37.

April 13—Route 15, Sections 2 and 3, Bridgeton-Millville, W. B. on Concrete Base, 8.00 miles, 20 feet wide with gravel shoulders, was awarded to the Tri-State Construction Company of Bridgeton, New Jersey, on their low bid of \$455,500.12.

April 14—Route 4, Section 14, Laurenton-Lakewood, 3.875 miles, Concrete Paving Job, 20 feet wide with gravel shoulders, was awarded to C. H. Earle of Hackensack, New Jersey on his low bid of \$144,705.68.

## Politicians Versus Frogs

When the Lee Highway delegation called on Governor Trinkle recently there was no second governor present to end the speech making by saying: "It's a long time between—"

However, Henry Roberts, of Bristol, member of the delegation, told the governor a frog story.

"There was a farmer," said Mr. Roberts, "who dropped into a hotel and found that the landlord was paying what seemed an enormous price for frogs. The farmer was interested and in response to his inquiries was told that the high prices were paid because of the scarcity of frogs. 'Why,' said the farmer, 'there are a million frogs on my farm.'

"Bring them in," said the landlord, "and I will pay the price."

"So the farmer went back home, abandoned his crops and sent the boys and hands out to catch frogs. At the end of two days they had captured a dozen. These the farmer took to town and sold them to the hotel. As he was leaving the landlord said:

"You told me you had a million frogs on your place. 'I know I did,' said the farmer, 'but I was judging by the noise they made.'"

Mr. Roberts added that the opponents of the highway department had raised a big clamor, but that on the "show-down" they had been found lacking in numbers.

—Highway News Digest.

## "Jack" Edwards Held Up By Highwaymen!



J. T. EDWARDS  
Still Smiling  
in Spite of that Hold Up

The Jersey Journal prints the following account of blow-out given to Jack Edwards, Maintenance Supervisor of the Central Division.

"John T. Edwards, brother of Governor Edward I. Edwards, was 'held up' last night on a lonely road between Cliffwood and Red Bank, N. J., by 'highwaymen' and was escorted to Stillwagon's Hotel, where he was entertained. The 'hold-up' men represented the employees of the Central Division of the State Highway Department. The event was in honor of the return of Supervisor Edwards from a vacation spent in Florida.

"The arrangements for the event were in charge of Assistant Superintendent of Motor Vehicles, J. J. Tyman, Foreman William Hunt and Auditor A. J. Amison and Assistant Secretary to Governor Edwards A. J. Dwyer. It was a complete surprise to Mr. Edwards, who was escorted to the banquet hall and seated at the head of the table, flanked on either side by Assistant Superintendent of Maintenance Woodruff and Frank P. Jones of Hoboken, who was speaker of the evening. Alfred Kerr of Hoboken of the Maintenance Division was master of ceremonies.

"At the conclusion of the supper the evening was spent in discussing good roads, good work, and good supervision.

"Mr. Jones went into the construction of the old Roman roads of England, the mecadam roads of Germany and others of which he said have been laid for upwards of 2,000 years and were still in service. The speaker referred to the apparent unity of feeling among the employees in working for one aim, namely, better roads. Mr. Jones received hearty applause at the conclusion of his remarks.

"Assistant Superintendent Woodruff spoke of 'Concrete Joints'. He referred to himself as being a 'concrete joint' at the supper, have been called upon as a 'filler in' owing to the absence of Superintendent A. W. Muir, who was in conference with State Highway Engineer Wasser, in Trenton. Mr. Woodruff's remarks caused much laughter and won applause. He passed jokes on all present.

"Superintendent Edwards said: 'This is indeed a surprise—an agreeable one. I am in favor of such gatherings, especially if told about it previously. I could have been invited instead of being 'Held Up' on the highway by 'highwaymen.'

"As you know I want good roads and I am going to have them if you work with me as you have in the past. I am proud of the roads under my supervision. We must work together and for the aims laid down by State Highway Engineer, Thomas J. Wasser. He is the greatest road builder and organizer in the State. I won't stand for any employee laying down on the job. He must do his work or quit.

"Mr. Edwards spoke at length on road work in this and other States. He said that the roads of New Jersey would be 100 per cent efficient before fall.

"Other speakers were Assistant Secretary Dwyer, Auditor McGowan, Assistant Superintendent J. J. Tyman, Charles Hurley, William Hunt.

## Big Blow-Out But No Fatalities

"Before the session adjourned Supervisor Edwards invited the guests to his summer home at Manasquan, N. J. for a supper, sometime in early June."

The Hudson Observer also makes mention of Jack's party in the following language.

"Supervisor John T. Edwards, of Jersey City, of the New Jersey State Highway Department, was the guest of honor at a dinner Monday night at Stillwagon's Hotel, Cliffwood, N. J. The event was given by the Central Division, N. J. S. H. D., in honor of the Supervisor's return from his vacation which, with Mrs. Edwards was spent in Florida.

"During the evening Mr. Edwards spoke on good roads and how to maintain them properly. He referred to State Highway Engineer Thomas J. Wasser, as the greatest road builder New Jersey ever had the honor to secure.

"The greatest asset the State owns today is good roads. Without good roads, the avenues of traffic are absurd. The farmer who some time ago was forced to take his produce to market with a team and farm wagon, can now be seen speeding to his point of disposal in big trucks. We see motor vehicles in competition with the railroads. Without the roads as they are, such conditions could not come to pass.

"It is true that several of the roads in New Jersey were not built for heavy traffic. They were constructed years before motor trucks were thought of. Built, I may say, in Colonial days, when a horse-drawn vehicle was the only means of travel.

"We are gradually overcoming these conditions and before fall I am sure not one of the thousands of visitors who take advantage of our highway systems will have cause of complaint. Route No. 1, from Elizabeth to Camden, cannot be equalled for the length of miles in any state. Other routes are equally as good.

"Because I praise the roads of our State, I don't mean that you men must lay down on your work. They must be maintained and I shall insist that you keep on doing your part and maintain them. Should any of you desire assistance in the work laid down for you do not hesitate to call upon me. In order to maintain the work properly we must work together.

"Other addresses were made by Assistant Superintendent of Maintenance Woodruff; Assistant Superintendent of Motor Vehicles, J. J. Tyman; Assistant Secretary to Governor Edwards, A. J. Dwyer; Auditor Charles Hurley and Frank McGowan. Alfred Kerr, maintenance division was master of ceremonies. Representatives from each of the twenty one New Jersey counties were present."

These newspaper clippings were the first intimation we had of the affair and editorially we wish to make the same comment as we saw inscribed upon an automobile tire repair shop:—

"Why not invite us to your blow-out?"

# The Highwayman of New Jersey



Signs like this give the visiting motorist information as well as a "warning."

## Warning Signals as an Aid to Motorists

New Road Helps that Are Doing Much to Eliminate the Dangers of Driving

We are all rapidly becoming familiar with the "Lighthouses" being placed along the New Jersey State Highway System and the subject of warning signals is, no doubt, of interest to a great many people.

A. The New Jersey State Highway Commission appreciates the importance of a State and National Signal system which shall "speak a common language."

B. With improved highway construction, increased volume of night traffic, limited headlight candle power, and the legal necessity for deflecting lens, an illuminated system of signals is required. A flashing light for use as a warning is desirable not only for reasons of economy, but primarily because such a signal is readily differentiated from any other form of illumination, and because the flashing light has a psychological effect—a positive attraction—which cannot be accomplished with any steady light.

Psychologists have repeatedly proven, that after a few seconds the human brain will not retain a distinct picture of any object thrown upon it by the eye. It is for this reason that we wink in order to give the brain a rest to reproduce a fresh image which will be distinct. The Flashing Light accomplishes this automatically without mental effort as contrasted with the diminishing effectiveness of the steady light.

C. The Standards Committee of the American Association of State Highway Officials has recommended to the various Highway Commissions a color standard which system has been adopted by the New Jersey Commission.

D. The American Gas Accumulator Company which has for more than fifteen years been developing an unwatched acetylene lighting system for marine service, has supplied this marine apparatus which is used on all of the Panama Canal lights and on 85 per cent of the marine lights now purchased all over the world. The AGA company after consulting with a number of State Highway Officials and the Executive Committee of the American Association

of State Highway Officials, has designed "Highway Lighthouses", which are sturdy of construction, economical of operation, and are applicable to every highway danger. They are entirely effective as a day warning, and have a flashing colored beam of light, which has a remarkable "wallop" at night. On a clear night this light can be discerned for a distance of approximately five miles. The color of the light tells the motorist the distance and the nature of the danger ahead. In addition to this as a motorist approaches within one hundred yards of the lighthouse, the illuminated wording of the lighthouse definitely describes the danger. Where a red lens is used, this illuminated wording reads "Danger Railroad", "Danger Bridge," or "Danger Stop." Where a yellow lens is used, an illuminated wording is shown with "Caution Grade" or "Caution Curve", with an illuminated dart showing whether the curve breaks to the right or left and whether it is a simple or reverse.

Where there is no fixed danger ahead, but merely a traffic intersection, a green lens is used with the illuminated wording "Cross Roads".

These Highway Lighthouses have a small pilot flame about as large as a head of a match, which burns continuously and which ignites the principle gas as supplied, which is about forty-five times per minute.

The Highway Lighthouse consumes less than two feet of gas per day if operating for a twenty-four hour period. It can readily be equipped with an AGA "Sunvalve" device which is used for the control of AGA marine lights, in which case the light will automatically be turned on at dusk, and off in the morning at sunrise.

The "AGA" Sunvalve will illuminate the signal during the day in case of heavy fogs or storms.

E. In determining the source for financing a state wide and nation wide installation of highway lighthouses, and the resulting operating cost, it was apparent that one national organization could accomplish a uniformity in construction.



Much more attractive than the ordinary "Bill-board", and makes possible a real public service.



No more "terrible accidents" when the deadly "crossing" has been eliminated.

## The Elimination of Grade Crossings

By H. C. Shinn, Engineer of Special Assignments

Two very serious accidents which occurred recently in the vicinity of Lakewood just a few days ago at grade crossings of the Central Railroad of New Jersey, in the first of which the woman driver who was the only occupant of the closed car was instantly killed and the machine wrecked at the River Avenue grade crossing of Route No. 4 and just a few days later about a mile and one-half from this point on the Central Railroad of New Jersey, where the Lakewood-Farmingdale road crosses the railroad, an ice-cream truck was hit and the driver and one other man occupant was instantly killed, calls our attention to the serious problem presented by grade crossings.

In justice to the railroads, it is easy to see how difficult it would be for them to secure the necessary funds to eliminate all grade crossings, as it is not easy to secure funds for betterments that will pay some returns, in the form of interest. The probability of the railroads being able to secure increased passenger and freight rates in sufficient amounts to enable them to pay for the tremendous amount of money which would be necessary to use in the elimination of crossings is remote, so from their standpoint the likelihood of their being able to eliminate grade crossings is very slight. From the standpoint of the State Highway Department and the county and municipal governments engaged in road building the elimination of grade crossings presents an equally great difficulty.

In order to imagine the public opinion the Department would be confronted with, just visualize the case of the nearest grade crossing condition to you and try to estimate the large cost which would be necessary in order to eliminate it. If you react on the average way, you would probably say that the money that it would take to eliminate this crossing would build a considerable length of road and

that we need roads more than we need elimination of crossings. On the other hand, those people who have heard and seriously think about the grade crossing accidents in which lives have been lost will say that no amount of money would be too large in order to save the lives of the people who have to use these crossings.

Sometimes the Highway Department sees an opportunity to improve the alignment of the highway at the same time eliminating one or two dangerous grade crossings, at a cost, although high, which would be insignificant compared with what the cost would be in a generation from now or even a comparatively short span of years, and when measured by the loss of life of citizens well known in the community through grade crossing accidents would be considered small.

The chances are all in favor of the general public approving the re-alignment and elimination work a few years after it was done and saying that it was the only sensible course to take, but without considering all the conditions people are prone to condemn far sightedness in such matters at the time when the work is proposed or else bring pressure of public opinion to bear upon their public servants, the governing body, in an effort to prevent expenditure of State funds for such work, while as before stated the same people would without a doubt commend the action of the governing body in a very few years after the work has been performed.

The necessity for making decisions in cases of this kind is one of the duties of public officials and while they do not expect the average citizen to have and to take all of the facts into consideration in judging the action of the governing body because they do not have the time and they are not trained along these lines, but it would be a matter of great gratification to these said officials if the people in judging actions of their servants would first en-

(Continued on page 10)



This will give you some idea of the work required to "eliminate" a bad crossing—but is worth all its costs, many times over. (Route 6—entering Bridgeton, N. J.)

Continued, page 9



# The Highwayman of New Jersey

9



Drills at work in the rock on Route 10 (Fort Lee Ferry) job

## Blasting a Road in the Solid Rock

By Roy Mullins

Route 10 of the State Highway System extends from the Market Street Bridge over the Passaic River at Paterson through Hackensack to the 130th Street Ferry at Edgewater, a distance of about eleven miles. This route, the shortest of the entire State Highway System, presented the most varied and rugged construction conditions of the entire system. Section 1-A, which has recently been opened to traffic from the Ferry at Edgewater to the top of the Palisades, Section 1-B now under construction extends across the plateau on top of the Palisades, Section 2, leads down the west side of the high land to the Hackensack valley, and Section 3 carries the route across the Hackensack meadows. Thus within a distance of five and a half miles there occurs heavy rock cutting, working up the face of a cliff two hundred feet high, extensive earth fills working down the other side of the ridge, and fills across tide marshes with unstable bottom.

The work on Section 1-A was started in the early summer of 1919. The roadway as designed was thirty-four feet between curbs with an eight foot side walk on one side. The road has a maximum grade of 6.5%, being 5% the greater part of the way and about 2% on the curves. This part of the road is literally blasted out of the face of the rock and the road is now flanked on one side by an almost vertical cliff over 100 feet high, and on the other side is supported by a retaining wall 50 feet high.

The rock excavation was accomplished by use of five jack hammers and five tripod drills operated by compressed air delivered through a 2 in. pipe line from a compressor plant at the foot of the hill. Horizontal holes up to 20 in. in depth were drilled close to the bottom of the excavation and loaded with dynamite which was exploded by electricity, so that the charges in several holes were blown up at the same time. The rock thus broken was picked up by three steam shovels and loaded on to cars operated on a narrow gage track which extended nearly the entire length of the work with necessary sidings,

etc. The railroad equipment consisted of forty double truck dump cars holding three cubic yards each and four twelve ton locomotives. The larger pieces of rock were delivered to cable ways, three of which were in operation on the construction of the retaining walls. These cable ways were about three hundred feet in length and were capable of lifting stones weighing several tons and placing them anywhere in the wall. As the wall was constructed, the equipment was moved ahead.

The smaller and irregular fragments of stone were deposited in an embankment which forms the north loop of the road. A stone crushing outfit was installed consisting of two crushers, elevator, screens and segregating bins to crush stone for use in concrete, which it was intended to use as permanent. However, after about three thousand tons had been crushed it was determined that stone could be delivered from commercial plants to the job cheaper than it could be crushed at this plant. The excessive cost of crushing was due to the difficulty of getting coal up to the plant, the necessity of rehauling the stone from the plant to a storage pile and the interference with the progress of the steam shovels.

The excavation and construction of the walls and drainage system was carried on continuously over a period of nearly two years. The maximum force employed was 125 men and an average force of 50 men was at work all of the time. In spite of the fact that this large force of men was concentrated in narrow confines where dynamite was used by the ton, it is a remarkable fact that no lives were lost and no serious injuries suffered by the men or damage done to property.

The original contract included the excavation, drainage and walls as described and also a stone block pavement on a concrete base. However, as work progressed it became evident that the side hill fill would continue to settle for some time, and it would be inadvisable to build a solid pavement which would crack badly as the fill con-

tinued to compact. For this reason the hard surface was eliminated from the original contract and a new contract let for the construction of a temporary bituminous macadam pavement which makes the road available for use and which can be maintained without difficulty until the fill has ceased to settle. This opens a new road from the Edgewater Ferry to Anderson Avenue, which is one of the main roads in this vicinity, and makes it no longer necessary to use the steep road leading to Fort Lee.

Section 1-B of this route now under construction will have a reinforced concrete pavement. This is a relocation of the route which has been adopted to divert heavy traffic from the high class residential section through which the route now runs.

Section No. 2, leading down to the Hackensack Valley, has been graded and contracts are to be awarded for the construction of the pavement and necessary bridges.

Section No. 3, leading across the meadows about two miles in length will probably be constructed during the present summer.



Under conditions like these, the operator has no choice—but we found this one smiling!

## Warning Signals as an Aid to Motorists

(Continued from page 6)

struction and economy in the cost of installation and maintenance, which could not be obtained by various municipal organizations. It was also apparent that any moneys used for this purpose would limit road construction and road maintenance by that same amount. It was also determined that with all the agitation and legal action against billboard advertising along the high-

ways, that this type of advertising was developing an ever increasing rate and unlike any other type of advertising, was not being "harnessed" for some public service.

The Highway Commission believes that by offering to national and local advertisers the privilege of advertising space on highway lighthouses, which shall be located along the roadside, it will accomplish a three-fold result:

1. Secure for the public an illuminated safety system of a character and scope which could not be financed by the State at the present time with the option of taking over this system and removing the advertising at the pleasure of the State.

2. Divert advertising appropriations to this public service which otherwise would be applied to the construction of additional billboards.

3. Govern the nature, character and size of the advertising appearing along the highways so that its subject matter will not be objectionable, its design will be pleasing, and its size will be unobtrusive.

F. The Highway Commission has for that reason contracted with the American Gas Accumulator Company of Elizabeth, New Jersey, and its subsidiary, the Highway Lighthouse Company, for the purpose of safeguarding the primary road system at no cost to the State, and at the

## Highwayman Attends Officers Training School

Mr. E. R. Sherbaum of the State Labor Division, who was selected to attend the officers training camp of Artillery Officers at Fort Sill, Oklahoma, has now resumed his duties with the State Labor Division. Mr. Sherbaum attained a very high record in his class and received a commission as Captain of Field Artillery in the Officers Reserve Corps.



Here's real work for a steam shovel! Taking up a dipper-ful of "coarse gravel". When the chunks are too big for the dipper, they are loaded as shown at the right



"Blasted out of the solid rock"—that's how they did the grading going down to the ferry. The approach and the loop, just above the ferry.



same time indicating on the side of highway lighthouses, the route number by an illuminated figure, and mileage and directional information.

Highway Lighthouses are being installed by the Highway Lighthouse Company at locations designated by the Commission, as rapidly as possible and have already proven their effectiveness in avoiding accidents. Since the installation of these lighthouses at a large number of the most dangerous points on our State roads, we have not a record of an accident resulting in deaths or injuries at any of these locations. While a continuation of this perfect record cannot be hoped for, there is no doubt in the opinion of the Highway Department that a State wide installation of highway lighthouses will result in a very decided reduction in the loss of lives and property.

The State is obligated to furnish its available police protection for the safe-guarding of these lighthouses. It is the desire of the Commission that any occasional vandalism or abuse be promptly reported to the State Constabulary and this office.

## Extracts from the Report of the Committee on Standards of the American Association of State Highway Officials Convention, Washington, D. C. December 13-17, 1920

Having in mind the necessity for an early adoption by the Associations of standard colors for highway warning signs and devices, the Committee submits the following color scheme as a tentative standard for such studies as may be necessary during the coming year.

**RED:** Indicating first degree danger to be used only at railroad crossings, dead end of roads, or lift bridges. All traffic to stop and proceed only when nature of passing the danger or of overcoming it has been ascertained.

**YELLOW:** indicating second degree danger, at curves and grades. Yellow would indicate a danger where the driver must slow down and proceed with caution.

**GREEN:** indicating moving or traffic danger only and to be used at road intersections.

**WHITE:** indicating a clear roadway.

## Precautionary Signs Maliciously Damaged

We have been informed that Lighthouse No. 8045 on Route No. 10, east of the Saddle River Bridge, had been damaged by someone with evident malicious purpose, as the lens had been stoned until it was broken, in spite of the fact that extra-heavy grid was placed over the lens in the hope that it would put a stop to such damage. It has been a common nuisance to the Department and other persons who erect signs for the benefit of the traveling public to have these signs damaged or broken up by people who use them as targets to practice on, by boys who do it for unaccountable reasons and by others for one reason or another, and who have no conception of the seriousness of their offense.

In order to stop this practice the State Police have been requested to be on the look-out for violators of the law who damage such property. The following letter was addressed to Col. H. Norman Schwarzkopf, Superintendent of State Police:

April 12, 1922.

Col. H. Norman Schwarzkopf,  
Supt. of State Police,  
State House, Trenton, N. J.

Dear Col. Schwarzkopf:

The State Highway Commission has an agreement with the American Gas Accumulator Company providing that the Company will erect cautionary signs, also known as highway lighthouses, at dangerous points throughout the

State. This is done by the Company at no expense to the State Highway Commission due to the advertising which is sold by the company.

We have received reports of one light-house in particular located on Route No. 10, east of Saddle River Bridge, known as No. 8045, which number is found on one side of the light-house. An investigation made by the Company shows that the lens in this light-house has been stoned until it was broken, although the lens are protected to some extent.

It is understood that this light-house is in the center of a foreign colony and your co-operation is requested in order to prevent a repetition of such an occurrence at this particular place and also to protect the light-houses in other sections of the State from similar abuse.

We will appreciate your co-operation in this connection.

Very truly yours,

E. J. WASSER,  
State Highway Engineer

## The Elimination of Grading Crossings

(Continued from page 7)

deavor to secure the fundamental facts entering into decisions of said officials, thereby assisting in the public work in which we are all interested.

H. C. SHINN,  
Engineer of Special Assg.

## Grade-Crossing Elimination

At the last annual meeting of the American Association of State Highway Officials, Neb., A. R. Hirst, State Highway Engineer of Wisconsin, read a very interesting paper on the subject "Safety and Beauty on Road Design and Construction." From this paper we quote the following bearing on the subject of railroad grade-crossing elimination:

After the curves and narrow surfacing comes the next most prevalent cause of highway accidents—the railway grade-crossing. The only safe grade-crossing is one which has been eliminated. Many accidents testify that all forms of so-called crossing protection fall down, even flagmen and gates. In planning new main highways every possible effort should be made to secure the elimination of all grade-crossings. Much can be done usually in re-locating the highways so as to avoid crossing the railways at all. Where two crossings with the same railway lie within five miles of each other, it will usually be cheaper to buy a new right of way on one side of the track and grade and drain it, than to separate the two crossings. If, however, there is something which must be met on the opposite side of the track, such as a village or city, which it is necessary to accommodate, this course may not be feasible, although quite usually between the two crossings some point can be found where a separation can be made accommodating traffic to and from the city or village in question, while the main line of traffic is left free.

Each case must be decided upon its merits, but both undergrade and overgrade crossings have disadvantages in alignment, and the best solution in four cases out of five, where the crossings are not too far apart, is to relocate alongside the track. Where a highway must cross a railway an overhead is usually superior to an undergrade crossing for several reasons, and is usually less expensive.

Up to recent years about two out of three grade separations built by the railroads have, in reality, been more dangerous to highway traffic than the grade-crossings they replaced, because the railroads paid no attention to the matter of highway alignment, and in almost every case used crossings perpendicular to their tracks with too sharp and sometimes blind approach curves. Such crossings are seldom, if ever, satisfactory where the highway is in general paralleling the railroad as many main highways naturally do, and when skew crossings have to be built, the decision almost inevitably falls upon relocating the highway.

## The Engineers

*Into the wastes of the desert,  
Into the mighty hills,  
Unheralded, lonely, courageous,  
Dauntless to work their wills,  
They fare them forth in the dawning  
In the light of the flaming sun,  
And weary they sink to slumber  
When their day of toil is done.*

*They are not blind to the glories  
That all about them gleam,  
The sunset, the moonlit mountains,  
The fish that leaps in the stream.  
Nay, rather they see a vision,  
In the burning desert sands,  
Of cities rising to splendor,  
Where the desolate cactus stands.*

*They dream of busy cities  
And homes for their fellow-men,  
Of laughter and tears and children—  
And they rise to work again.  
They tunnel the depths of the mountains,  
They wade through the stinking bog,  
They freeze in the icy winter,  
And toil in the heat and the fog.*

*I think, when the mountains are crumpled,  
And the ray of the last, red sun  
Looks down on ruined nations,  
And the glories of earth are done—  
I think, in the hush of the silence,  
When the cycles of life are run,  
There shall come to the men who have labored  
The sound of a voice: "Well done!"*

—HERBERT EDWARD MIEROW.

The author of the above poem was a brother to the late Frederick C. Mierow, who was employed as an Assistant

Engineer by the Department, and was well-known and liked by men of the Central Division and the Right of Way Division. Mr. Fred Mierow spent a great deal of his engineering life in work in the West, meeting conditions of the Field Engineer from which we imagine his brother has gained his idea of the "Engineer." Mr. Herbert Mierow is now taking a post-graduate course in the Graduate College at Princeton University. He has spent sometime as Assistant Professor in the Department of Classics, Colorado College, Colorado Springs, Colorado. There are few writers who see the romance and serious purpose in engineering life. THE HIGHWAYMAN wishes Mr. Mierow further success in his literary efforts.

## Sharp Turns

BY JAMES W. BROOKS  
From the Highway News Digest

More rigid specifications for public service would exclude a lot of faulty human material.

It's a short road—very short—that has no political turn.

One of life's riddles is why the road critic who doesn't know what he is talking about is so anxious to tell everybody.

Waiting for the sun to make roads passable after every rain, when good engineering will do it once and for all, is another fool occupation.

Good roads pay in bad weather, while bad roads waste, even in good weather.

The average man who opposes an increase in taxes to decrease waste on roads has a one-track mind—and the switch is thrown on that most of the time.

Less mileage and more wear leads to more mileage in the long run, since roads that are built right stay right.



In front of Seaview Golf Club, near Atlantic City, (Route 4)

## Warrenite—Bitulithic Pavements Have Stood Up Under Heavy Traffic For 15 Years

The test of the paving is in the riding—and the cost of upkeep.

Upon either of these points we invite your critical investigation.

Some of the oldest paved roads in New Jersey were laid under the Warren patents.

Many of these have been in constant use under heavy traffic for fifteen years.

They are still in excellent condition.

"The Best Road You Can Buy Is the Cheapest in the End."

**Warren Bros. Company**

District Office 50 Church Street, New York City, N. Y.



IN USE SINCE 1889

## Dragon

PORTLAND CEMENT

Next Time You Have Cement Trouble  
Get Wise to "Dragon"

Not that we make all the good cement in the world—we don't! But what we do make is good. It's absolutely dependable. And along with its dependable goodness, there is our dependable service.

We make a point of shipping promptly. That's why so many contractors who are old hands at the game have turned to "Dragon"—and stick to it.

"For Cement you can depend on—use Dragon"

**Lawrence Cement Co.**

PHILADELPHIA

302 Broadway, NEW YORK

## Concrete Roads Add Years to Your Car's Life

Dust, mud and splatter, the rack and strain on the mechanism from bad roads, all cause rapid depreciation from the day you start driving.

Concrete hard-surfaced roads are clean, dustless, even, firm and skid-proof in all kinds of weather. They add years to your car's life—help to keep it at top value for service, exchange or sale.

*Our Booklet R-3 tells other interesting things about Concrete Roads. Write for your copy.*

**PORTLAND CEMENT ASSOCIATION**

347 Madison Avenue, New York

*A National Organization to Improve and Extend the Uses of Concrete*

Offices in 23 Other Cities



# GLUTRIN

## Four Reasons Why All Gravel Roads Should Be Treated With Glutrin

First: Glutrinized gravel roads are hard all the year round.

Second: Glutrinized roads shed water—and for that reason they do not rut up during the winter and Spring.

Third: Glutrin is the best binder yet discovered for gravel stone, sand-clay, or slag or earth roads.

And finally: Glutrin is not only the best binder, but by far the most economical.

### What Local Authorities Think of Glutrin Road Binder:

*Taken from the Daily Pioneer of Bridgeton, N. J., Tuesday, February 14, 1922*

#### "SHOWS VALUE"

"Last fall the state highway department caused west Commerce street to be flushed with glutrin, an oil-like preparation which has for its object the laying of the dust and preventing the gravel on the roads to be cut up with the traffic. The glutrin application also has had the effect of giving the street a surface which turned much of the water, and the results show a very much improved condition this winter. While most of the gravel streets are soft with mud, west Commerce street is comparatively firm and free from mud, and much smoother in consequence. The experiment would seem to indicate that the glutrin application greatly improves dirt roads."

Glutrin has been manufactured by us in our own plants for over 15 years. We have our own tank car line in which to deliver the product. The material used in New Jersey was applied by Mr. M. R. Young, Trenton, N. J., with pressure distributors especially built to handle this product.

Send us your name, and let us put you next to Glutrin!

**Robeson Process Company**  
Fifth Avenue Building, 200 Fifth Avenue, New York

# The Highwayman of New Jersey



Springfield avenue, Summit N. J., constructed with "Tarvia-x" in 1915

## As Good As New After Seven Years Of Service

After seven years of heavy traffic, the Tarvia Penetration pavement on Springfield Avenue, Summit, is today as smooth and firm and trafficproof as when it was first constructed. This road has come unscathed through the freezes of seven winters, the thaws of seven springs, the grind of seven years' continuous usage.

And hundreds of other Tarvia Roads in New Jersey are giving the same economical service. They are always open for traffic—always free from dust and mud.

Let the experienced road engineers of our Special Service Department tell you how you

can maintain them at so small an expense that the saving in upkeep alone—in a few years' time, will offset the entire original outlay for construction.

Tarvia is made in different grades for all road requirements—new construction, maintenance, and repairs. It can solve the problem of low cost, low upkeep, good roads for your community, just as it has for thousands of other communities throughout the country.

Please address your inquiry to SPECIAL SERVICE DEPARTMENT, through our nearest representative.

# Tarvia

For Road Construction  
Repair and Maintenance

No highway engineer or road official should be without a copy of our latest manual, "Road Maintenance with Tarvia". Our nearest office will send free copy on request.

C. C. RANDOLPH  
Telephone 2466, PLAINFIELD, N. J.  
ASHLEY BURNER  
Telephone 2232, PLAINFIELD, N. J.

The *Borrett* Company  
40 RECTOR ST., NEW YORK CITY

C. A. BAKER, JR.  
Telephone 323, CLOSTER, N. J.  
H. M. SMITH  
Telephone 96M, RIVERTON, N. J.



(Courtesy Portland Cement Association)

## "Vulcanite"

A single word---But it Speaks Volumes!

It speaks volumes, because of the things which go back of it.

First, Portland Cement, that which there is none better made anywhere in the world.

Second, a reputation for prompt service—a reputation which we jealously guard.

Third, our great plant at Vulcanite (Warren County) with its capacity of 2,000,000 tons a year.

"Let's get together and talk Cement!"

## VULCANITE PORTLAND CEMENT CO.

PHILADELPHIA

BOSTON

NEW YORK



## Next Time You're Held Up For Cement Remember That

### Edison Can Ship 150 Cars A Day

There are several things which may hold you up on your road work.

But if you are held up for cement—it is your own fault. Edison—with trackage and packing houses so arranged that twenty-five cars can be loaded at one time—is equipped to ship one hundred and fifty cars each working day! Furthermore, we are producing cement right here in New Jersey.

So remember our policy

"Edison service—Cement when you want it!"

## EDISON PORTLAND CEMENT CO.

NEW YORK

BOSTON

PHILADELPHIA

PLANT: NEW VILLAGE, N. J.



## ALONG THE ROAD



**Safety Does Come First**

**Danger Ahead**

*1. Old Mill (Route 13, Kingston, N. J.)  
When you're out driving and come to a beauty spot such as this—"stop—look—and listen!"*

The statistics of automobile accidents continue to pile up alarmingly.

But every careful investigation goes to prove that the great majority of them could have been prevented. A certain number are real accidents—they could not have been foreseen or guarded against.

Still more are due absolutely to darn-fool reckless driving.

But the biggest class of all are due to ignorant carelessness in not knowing, or using, SIGNALS.

The signals shown below are coming into nation-wide use. They are simple, easily memorized, and effective.

You owe it, not only to yourself, but to your fellow-motorists, to learn these signals—AND TO USE THEM.

"A word to the wise"—should save many repair bills, and funeral expenses.



Boy:—"Dad, what do you call a man who drives a car?"

Pop:—"That all depends on how close he comes to hitting me!"



Talk is not cheap to the taxpayer who permits his acts in road matter to be governed by the wrong kind.

Speaking of white mule, two rustic sports were uncertainly flivvering their way home from the county seat.

"Bill," said Henry, "I wancha to be very careful. Fir-thing, y'know, you'll have u- in a ditch."

"Me," said Bill in astonishment. "Why, I thought you was drivin'."—Exchange.



In the old days when a man wanted to commit suicide, he blew out the gas. Now he steps on it.



**He's Not the Only One**

A fellow who hailed from Oshkosh,

Had about as much brains as a squash,  
All corners he'd round with two wheels off the ground,  
And now he's an angel, b'gosh!



**The Passenger Critic**

There is one pest I fain would swat,  
Lambast and skin alive;  
It is the cuss who sits in front,  
And tells me how to drive.



*Memorize these signals NOW! They may save your life—or some one's else—some day.*

# Road Tips



## MONTHLY BULLETIN OF DETOURS

Published by the New Jersey State Highway Commission  
Commenced in May, 1922

*This is only printed when there is a "Detour with a Detour"*

(Color signals to right when used along all State roads as far as possible.)

**ROUTE NO. 1—Greenwood Avenue near the City of Trenton**  
Trenton, N. J. Traffic will detour from Greenwood and Federal Avenue to Federal Avenue to Trenton, N. J. and over Federal Avenue to North and West and Meridian to Route No. 1.

**ROUTE NO. 3—Camden Berlin**

Traffic to the shore from Market Street Ferry, Camden, will go out Federal Street to Haddon Avenue to Mt. Ephraim Avenue thence over Mt. Ephraim Avenue through Mt. Ephraim to Chew Landing, Blackwood and Clementon to Berlin.

Traffic from the shore will leave the White Horse Pike at Berlin going through Gibbsboro, Haddonfield, Ellisburg and over the Marlton Pike to Federal Street, Camden, thence over Federal Street to the Market Street Ferry.

**ROUTE NO. 4—Eatontown Long Branch Road and Allenhurst.**

Detour at Eatontown over South Street through Oakhurst to Deer Beach.

**ROUTE NO. 4—Under construction through Avon.**

Traffic will be carried through construction.

**ROUTE NO. 4—Sea Girt Avenue.**

Short detour over local streets.

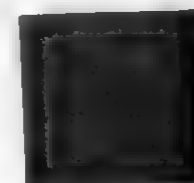
**ROUTE NO. 4—Laurelton Lakewood.**

Traffic will go from Laurelton through Cedar Bridge and Silverton to Toms River.

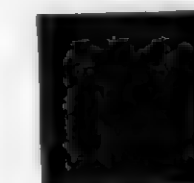
**ROUTE NO. 4—Point Pleasant.**

There will be a short detour over local streets.

(Continued on Reverse)



This color (blue) on posts or signs indicates a detour in the North and South



Red shows that it lies East and West

While yellow tells you that it takes a diagonal course south-east or north-west



And brown indicates that it takes a diagonal course north-east or south-west



## For You— "The Highwayman"

Do you use roads? Do you want to know where they are being built, and what detours to take, each month?

Then send, TODAY, to

**The Highwayman**  
New Jersey State Highway Department  
Trenton, N. J.

Just ask to be put on The Highwayman's list. A postal will do.

## MONTHLY BULLETIN OF DETOURS

(Continued)

### **ROUTE NO. 5, Section 5—Convent Station to Madison.**

Detour hereabouts at the corner of South Street and Madison Avenue in Morristown, and proceed from there on South Street in a southerly direction to the Morristown-Green Village Road; from thence still southerly on the Morristown-Green Village Road to Loantaka Way; thence easterly on Loantaka Way to Woodlawn Road; thence still easterly on Woodlawn Road to the Madison-Green Village Road; thence northeasterly on the Madison-Green Village Road to Kings Road; thence southeasterly on Kings Road to Waverly Place; thence easterly on Waverly Place to Route No. 5 in Madison.

### **ROUTE NO. 6—Mullica Hill-Shirley.**

Detour via Woodstown, Alloway and Aldine to Bridgeton.

### **ROUTE NO. 6—Woodstown-Salem.**

Detour via Woodstown and Sharptown to Salem.

### **ROUTE NO. 6—Salem-Quinton-Bridgeton.**

Detour from Salem through Hancock's Bridge, Harmersville, Canton and Roadstown to Bridgeton.

### **ROUTE NO. 9—Perryville-West Portal: Hunterdon County.**

Detour via Vinton, Glen Gardner, Hampton, Asbury, West Portal 1921 work.

### **ROUTE NO. 9—Bound Brook-Somerville.**

Detour over the old turnpike between the points mentioned.

### **ROUTE NO. 12—Phillipsburg-Port Colden: Warren County.**

Detour via Phillipsburg, Bloomsbury, West Portal, Asbury, Washington and Port Colden. 1921 work.

### **ROUTE NO. 12—Denville-Parasippany-Pine Brook: Morris County.**

Detour via Denville, Tabor, Morris Plains, and Littleton to Cobb's Corner, Parsippany and thence over Route No. 12 to Pine Brook and Paterson. 1921 work.

### **ROUTE NO. 13—Which is the Lincoln Highway.**

Is under repair between Lawrenceville and Princeton. Traffic is advised to detour via Washington Street, Princeton, across Carnegie Lake and the canal to the Brunswick Pike at Penn's Neck, turning south over the Brunswick Pike to the City of Trenton. North-bound traffic will take the reverse of this route which is out Brunswick Avenue, Trenton, continuing out the Brunswick Pike to Penn's Neck just east of Princeton, where traffic will turn to the west going over the canal and Carnegie Lake through Washington Street to Nassau Street, Princeton, and turning north on the Lincoln Highway and going to New Brunswick.

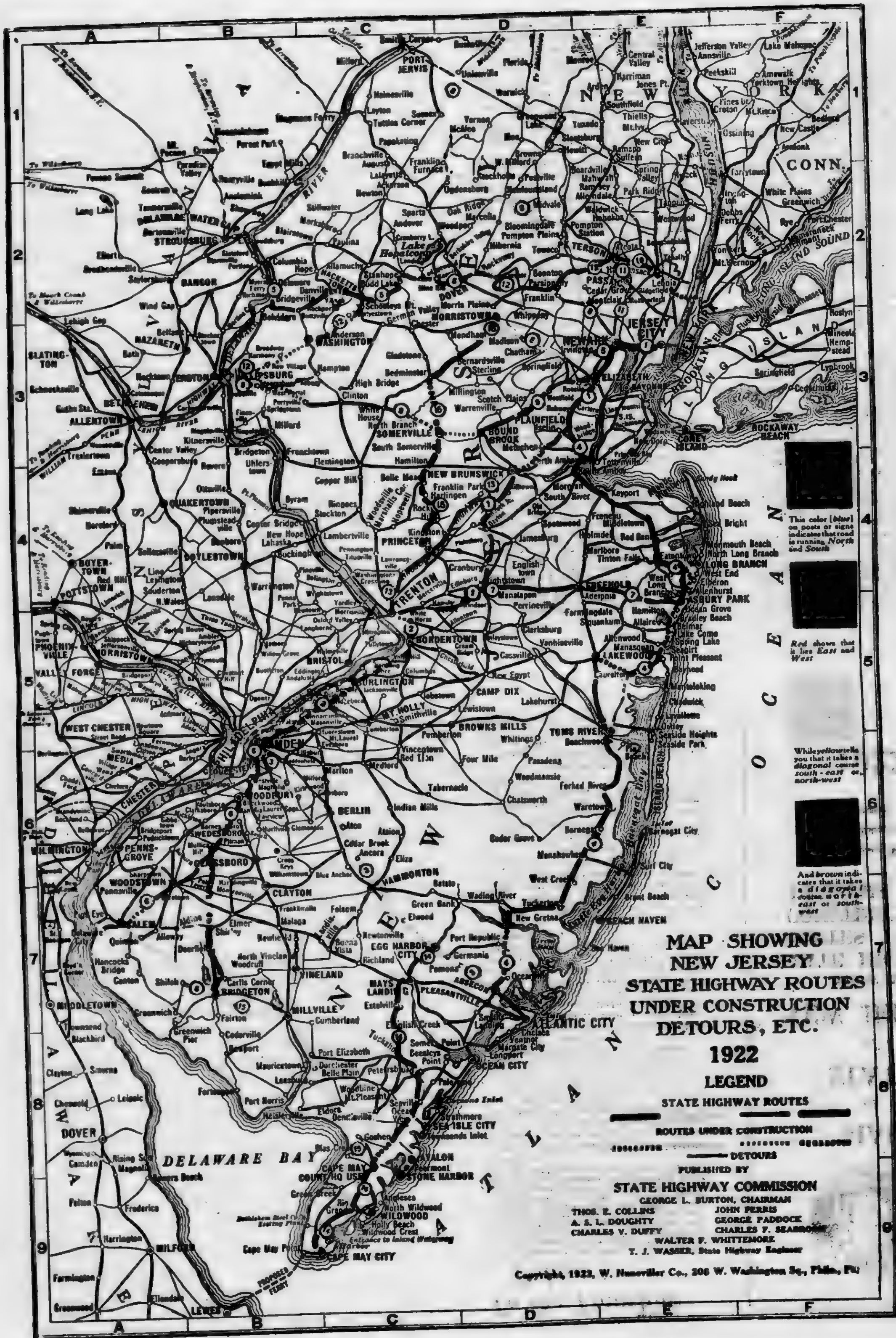
### **ROUTE NO. 14—Cape May Court House-Swainton.**

Detour from Swainton through Avalon, Peermont and Stone Harbor to Cape May Court House.

### **ROUTE NO. 15—Bridgeton-Millville.**

Detour from Bridgeton via Carmel to Millville.





## To the Traveling Public:—

The following information is compiled for the convenience of the traveling public ON STATE HIGHWAYS ONLY. Directions are given to more conveniently avoid those sections of Routes that are now under construction. Kindly NOTE and OBEY all detour signs and warnings. These are placed for your guidance and protection, and to enable the State Highway Commission to carry out its 1922 Construction Program without interruption.

### N. J. STATE HIGHWAY COMMISSION.

(This information was prepared in March, 1922, and the Construction Program is subject to change. Monthly detour bulletins will be issued giving such changes.)

*Note: The traveler will find poles banded along each route to correspond to the colors indicating the direction of the routes.*

### DETOUR—FOLLOW THE ARROW.

#### ROUTE NO. 1.

Jersey City to Trenton, 45 miles, via Newark, Elizabeth, Rahway, Metuchen, New Brunswick and Hightstown. Under construction near Elizabeth. Obey all detour signs. Under construction between Metuchen and New Brunswick. One-way traffic will be carried through the construction work. Route No. 1 is the Lincoln Highway between Jersey City and New Brunswick.

#### ROUTE NO. 2.

Trenton to Camden, 28.5 miles, via Bordentown, Fieldsboro, Rocking and Burlington. Under construction South Broad Street, Trenton, and White Horse near Trenton. One-way traffic will be carried through construction.

#### ROUTE NO. 3.

Camden to Absecon, 47.8 miles, via Berlin and Hammonton. White Horse Pike from Camden to Berlin under construction. Detour over Blackwood Pike through Mt. Ephraim, Blackwood, Clementon, to Berlin. Obey all detour signs.

#### ROUTE NO. 4.

Rahway to Absecon, 111.5 miles, via Perth Amboy, Keyport, Middletown, Red Bank, Long Branch, Asbury Park, Point Pleasant, Lakewood, Toms River, Tuckerton and New Gretna.

Under construction through Red Bank. Detour over local streets following signs. Under construction from Eatontown, Long Branch Road through West Long Branch and Norwood Avenue to Asbury Park. Follow signs. Under construction in Avon-by-the-Sea and Sea Girt. Also in Point Pleasant and between Laurelton and Lakewood. At Laurelton detour through Silverton for Toms River. Under construction short sections in Toms River, Barnegat and Tuckerton. One-way traffic will be carried through construction. Under construction between Mullica River and Smithville. Follow present road through Port Republic: new construction over new alignment. (Obey all detour signs.)

#### ROUTE NO. 5.

Newark to Delaware Bridge at Delaware, 43.5 miles, via Morristown, Dover, Netcong, Budd Lake, Hackettstown and Buttsville. Under construction in Madison, Morristown and Mine Hill. One-way traffic will be carried through construction. Under construction between Hackettstown and Denville (Great Meadows). Obey all detour signs.

#### ROUTE NO. 6.

Camden to Salem, 36.7 miles, via Woodbury, Mullica Hill and Woodstown. Mullica Hill to Bridgeton, 28.5 miles, via Pole Tavern. Salem to Bridgeton, 18 miles, via Quinto and Shiloh. Under construction in Woodbury. Obey all detour signs. Under construction Mullica Hill to Shirley. Use State Highway to Woodstown, and from Woodstown towards Salem follow detour signs to Alloway, thence back to Shirley and thence to Bridgeton. Traffic for Salem will go from Woodstown to Sharptown, thence over the road through Pointers to Salem. Under construction from Salem through Quinton to Shiloh and Bridgeton. Traffic between Salem and Bridgeton will follow road via Hancock's Bridge, Canton, Roadstown and Bridgeton. Pearl Street, Bridgeton, under construction, follow signs. (Obey all detour signs.)

#### ROUTE NO. 7.

Hightstown to Asbury Park, 28.2 miles, via Freehold, Jerseyville and Hamilton.

#### ROUTE NO. 8.

Montclair to New York Line at Unionville, 45 miles. Under construction from Saegert to Unionville. Obey all detour signs.

#### ROUTE NO. 9.

Elizabeth to Phillipsburg, 49.5 miles, via Westfield, Plainfield, Bound Brook, Somerville, White House, Clinton, West Portal and Bloomsbury. Under construction through Plainfield. Obey all detour signs. Under construction



## MAP of STATE of NEW JERSEY Showing STATE HIGHWAY ROUTES UNDER CONSTRUCTION, DETOURS, ETC.

Together With  
Main Automobile  
Routes

1922

from Bound Brook through Somerville to North Branch. Obey all detour signs. Under construction from Phillipsburg (West of Clinton) to West Portal. Traffic for Phillipsburg detour at Clinton via Glen Gardner, Hampton, Asbury and West Portal. Obey all detour signs. Under construction from Bloomsbury to Phillipsburg. Take road via Stewartville and Straw Church. Obey all detour signs.

#### ROUTE NO. 10.

Paterson to Fort Lee Ferry, 10 miles, via Dundee Lake and Hackensack. Under construction near Ridgefield and Little Ferry. Obey all detour signs.

#### ROUTE NO. 11.

Newark to Paterson, 11 miles, via Belleville, Nutley and Passaic. Under construction Main Street, Passaic. Obey all detour signs.

#### ROUTE NO. 12.

Paterson to Phillipsburg, 40.9 miles, via Little Falls, Pine Brook, Parsippany, Denville, thence over Route No. 5 to Hackettstown, thence via Washington and Broadway. Under construction Parsippany to Denville. Detour at Parsippany for Beonton, thence over road to Mountain View to Denville. Under construction Port Colden to Phillipsburg. Obey all detour signs.

#### ROUTE NO. 13.

New Brunswick to Trenton, 24.9 miles, via Kingston, Princeton and Lawrenceville. This is the Lincoln Highway between New Brunswick and Trenton.

#### ROUTE NO. 14.

Egg Harbor City to Cape May City, 48.2 miles, via Mays Landing, Tuckahoe and Cape May Court House. Under construction Cape May Court House to Swainton. Detour via Avalon, Peermont and Stone Harbor. Obey all detour signs.

#### ROUTE NO. 15.

Bridgeton to Route No. 14 at No Grande, 45.1 miles, via Millville, Dorchester, Dennisonville, Cochen, Dias Creek and Green Creek. Under construction from Bridgeton to Millville. Detour via Carmel. Obey all detour signs.

#### ROUTE NO. 16.

Morristown to Princeton, 37.1 miles, via Van Dorn's Mills, Bernardsville, Far Hills, Bedminster, Pinckney, Somerville, South Somerville, Belle Mead and Harington. Under construction from Somerville to South Somerville and from Somerville through Far Hills to Mine Hill. Traffic will be carried through construction. Under construction from Van Dorn's Mills to a point near Morristown. One-way traffic will be carried through construction.





Brunswick Pike, at Baker's Basin

The Highwayman Is Out  
For More and Better Roads  
in New Jersey

May, 1922  
Vol. I  
No. 10

## Good Roads

### What Do They Mean in Your Young Life?

The term "good roads" is an old term, but it has taken on a new meaning. With the advent of the railroads, it looked for a time as tho the other roads would become of secondary importance—that their work would be confined to "feeding" the railroads.

All that has changed. The advent of modern motor transportation, and with it, the development of the permanent, always travelable, hard-surfaced highway, has again made ROADS of prime importance. It is not exaggerating to say that at present we could get along better without our railroads than without our modern "good roads" systems;—though, of course, we need them *both*.

Put in a nut-shell, there are just two big reasons why good roads are so all-important:

The first is, that the only thing in the world which is absolutely limited is *TIME*.

The second is, that *good roads* are the greatest savers of *TIME* that man has ever invented.

That is where they hit YOU.

Your production, your income, your pleasures, your achievements are all measured and limited by *TIME*.

Just stop a moment and figure up the amount of time that you spend—*waste*—in getting from place to place.

Then the overwhelming importance of *good roads* becomes self apparent.

Be a booster for "good roads."

Make yourself familiar with what *good roads* really are.

Invest some of your *intelligence*, as well as your money (through taxes) in good roads—they are the greatest dividend payers the world has ever known.

*The Highwayman*



BEFORE (June 29,) 1921—and—AFTER (May 11,) 1922

Not only on the "open roads", but also in towns and cities, have there been deplorable road conditions to remedy.  
(Route 4—Section 5; Red Bank-Etontown)

# The Highwayman of New Jersey

## The Highwayman

Published Monthly By The  
State Highway Department, at Trenton, N. J.

The HIGHWAYMAN will be sent free upon application  
to any citizen of New Jersey who is interested in  
"More and Better Roads For New Jersey!"

### THE HIGHWAYMAN

H. C. SHINN, Editor in Chief

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A. LEE GROVER R. B. GAGE  
C. F. BEDWELL EDWARD E. REED  
CHAS. FISHBERG

#### Managing Editor

F. E. ROCKWELL

#### State Highway Commission

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JOHN FERRIS - - - - - Jersey City  
GEORGE PADDOCK - - - - - Newark  
WALTER F. WHITTEMORE - - - - - Newton  
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ALBERT S. L. DOUGHTY - - - - - Mt. Holly  
CHAS. F. SEABROOK - - - - - Bridgeton  
CHAS. V. DUFFY - - - - - Paterson

#### State Highway Association

President - - - - - A. W. MUIR  
1st Vice President - - - - - W. A. JOHNSON, Laboratory  
2nd Vice President - - - - - J. L. VOGEL, Bridge Division  
3rd Vice Pres. - - - - - WILLARD EMMONS, Equipment Div.  
4th Vice President - - - - - G. R. MOORE, Right of Way  
5th Vice President - - - - - WM. J. MCGOVERN, State Labor  
6th Vice President - - - - - H. D. ROBBINS, Construction  
Executive Secretary - - - - - EDWARD W. O'BRIEN

### Vandals of the Road

We have noticed that some of the warning signals placed along the State Highway System, and showing an intermittent flashing light, automatically controlled, have been intentionally broken.

Presumably the work of boys. And yet it is hard to conceive of the boy—even the "bad" boy who likes to "show off" to his companions—who would do damage of this kind if he gave a moment's thought to the result.

The destruction of one of these signals may easily be the direct cause of a serious accident—even death.

Wherever and whenever you come in contact with boys, teach them to have respect for the State's property.

And why not suggest to your local Boy Scouts that one of the good things they can do is to watch these warning signals, and report, with all the information they can get, any injury to them.

### NOTE

#### Supplement for May Omitted

Due to the spring season's pressure of road work in this office, it has been necessary to postpone the issuing of the next "Road-builder's Supplement" until next month. At that time, the following papers, with the discussions upon them, will be published: "Highways", by Hon. James H. MacDonald, Former State Highway Commissioner of Connecticut; and also "Precautions Necessary for the Proper Application of Glutrin to Gravel Roads", by Maurice R. Young, Contractor.



Bill Wildblood

Purchase Clerk of the Department

"I am willing to buy it if—"

"Bill"—who was christened Robert William, though nobody ever calls him that now—was also born in Trenton, in 1896.

His first work in life was testing rubber—which was better in those days than it is now. After attending the Trenton Public Schools, and later taking a Secretarial Course in Rider College, Bill again took up the rubber business, but only for a short time.

In the fall of 1913, he accepted a position with the Department of Conservation and Development (then known as the Geological Survey) and was assigned to the Laboratory. In connection with the Laboratory work Bill earned the distinction of being one of the first men to act as Material Inspector for the Highway Department.

In the fall of 1917 Bill was transferred to the Main Office of the Department in the capacity of Clerk-Stenographer. In 1918 he served with the 7th Engineers Training Regiment at Camp A. A. Humphreys, Virginia.

In the spring of 1919 Bill was appointed to the position of Assistant Business Agent which he retained until the position was abolished in the fall of 1920 at which time he was made Purchase Clerk.

This photograph of Bill was snapped during the New Jersey State Highway Convention and by the expression on Bill's face, we don't know whether he had his mind strictly on business, but from past experience we judge he was getting ready to say, "I am willing to buy it, if you get the Chief's O. K."

### Chinese Moving Graves for Road Builders

It may have been difficult in earlier years to get graves removed in China and doubtless is so today as regards certain graves, but in this respect as in others the conditions of China have materially changed within recent years. For instance, the road from Hantan to Tamingfu has only three curves in 47 miles, and the last 27 miles are without a curve. It would not be possible to run such a road anywhere in the great plains of China without striking many graves. Yet the road was built without any trouble or delay. In Shantung, while the roads were being built, the standard rate of \$2, Mexican, was established as payment for a grave. The owner moved it and in this Province no delays were encountered on account of the graves.—*Highway News Digest.*

### County Engineers Please Note

The columns of the HIGHWAYMAN are open to you and we cordially invite you to write up the job or jobs in which you are particularly interested, either supplying the necessary photographs or advising the Department that you would like to have us take photographs of your work to accompany your article.

The reimbursement construction work will offer opportunity for some excellent articles.



Norman C. Applegate

Supervisor of Equipment, State Highway Dept.

Norman C. Applegate, better known as "Norm."

With the exception of eighteen months which he spent with the A. E. F., in the 303rd Engineers, Norm has been with the Highway Department since 1913—consecutively as Foreman, Superintendent of Construction, and Supervisor of Equipment.

Like several other of the boys, Norm is a Trentonite by birth. He became a resident here in 1889, and has remained ever since.

He attended Trenton Public Schools and Carnegie Institute and received his degree in Civil Engineering with the Class of 1908 at the latter institution.

He was connected with the Trenton Iron Company as Engineer-Draftsman, and with the Eastburn Company as Superintendent of Construction on several jobs in New York, New Jersey, and Pennsylvania, for five years previous to entering the employ of the State.

The photograph above was taken after Art Bullock and Harry Shinn had tried to convince him that an automobile jack would not work. You can readily see what sort of an argument Norman thought they were putting up. This is the same type of smile that greets all officials when they try to put something over on Norm.

### Spring Inspection Trip N. J. Association of County Engineers

The New Jersey Association of County Engineers will hold its Spring Inspection Trip on June 16th and 17th. The Association consisting of various County Engineers and their Assistants, will examine the methods of construction and materials used in the various counties and state road and bridge jobs, particularly in the Counties of Essex, Hudson, Bergen, Passaic, Morris, Warren, Hunterdon and Mercer.

Considerable interest is being taken in this inspection trip as the relative merits of different types of road pavements are now being keenly discussed.

The Members of the State Highway Commission and State Highway Engineer Wasser will be on the trip, and will discuss with the County Engineers the various types of improvements.

The Boards of Freeholders are requesting their engineers to make the trip as the examination of the different types of roads in the several counties, and the resulting discussion at the County Engineers' meeting, will tend to give new and broader ideas to each engineer.

The Engineers' meeting will be held on the evening of June 16th in the Karlton Hotel at Easton, Pa. The various standing committees on specifications, bridges, etc., have promised to submit interesting and instructive reports.

The Engineers will visit several of the cement mills in and around Easton, where the methods of manufacture and the merits of the different kinds of cement will be pointed out.

The party will assemble at the Robert Treat Hotel in Newark on June 16th, at 10.00 A. M. Daylight Saving

### NEW JERSEY STATE HIGHWAY DEPARTMENT

March 1st, 1922

#### Executive

HON. EDWARD I. EDWARDS, Governor

The State Highway Commission

and

THOMAS J. WASSER, State Highway Engineer

#### ADMINISTRATION

A. LEE GROVER, Secretary and Chief Clerk

M. L. HOWELL - - - Chief Auditor and Accountant

CHAS. FISHBERG - - - Assistant Chief Clerk

MISS GRACE WILLIAMSON - - - Chief File Clerk

R. W. WILDBLOOD - - - Purchase Clerk

#### CONSTRUCTION DIVISION

C. F. BEDWELL, Construction Engineer

G. R. MOORE, Ass't Construction Engineer

R. A. MEERER - - - Right of Way Engineer

C. A. MEAD - - - Bridge Engineer

THOMAS GEORGE - - - Acting Supt. of State Labor

C. A. BURN - - - Northern Division Engineer

H. D. ROBBINS - - - Central Division Engineer

J. A. WILLIAMS - - - Southern Division Engineer

#### MAINTENANCE, EQUIPMENT AND PROJECTS DIVISION

EDWARD E. REED, Assistant State Highway Engineer

A. W. MUIR - - - Superintendent of Maintenance

JACOB HAGIN - - - Superintendent of Plant and Equipment

N. C. APPLGATE - - - Supervisor of Equipment

A. D. BULLOCK - - - Projects Engineer

H. C. SHINN - - - Engineer of Special Assignments

#### TESTING LABORATORY

R. B. GAGE, Chemical Engineer

J. G. BRAGG - - - Senior Testing Engineer

F. H. BAUMANN - - - Senior Testing Chemist

Time. A detailed itinerary is now being prepared and will be sent out later.

The officers of the Association are:

HARRY F. HARRIS, County Engineer of Mercer, President

FRANK J. RADIGAN, Acting County Engineer of Hudson, Secretary.

ROSCOE P. MCCLAVE, County Engineer of Bergen, Vice President.

GARWOOD FERGUSON, County Engineer of Passaic, Treasurer.

### Memorandum for Next Issue of Highwayman

In order that the HIGHWAYMAN may be ready for distribution by the first of each month, it has been decided to have bulk matter ready for the printer a month and ten days previous to publication date, and all photographs should be ready for the printer approximately a month and one-half in advance of the date of issue, that means that the photographs for the June Issue should be submitted to the Editor-in-Chief not later than the 12th of April and reading matter not later than the 20th of April.

In the handling of monthly publications where cuts and intricate arrangement are necessary, the matter for publication is required sometimes three months in advance of the date of publication, so the HIGHWAYMAN is not requiring an excessive amount of time for the submission of matter for its publication.



## Contract News

### Roads to Be Built and Who Will Build Them

Prepared to April 19, 1922

Every user of roads is interested in where new roads are to go, and in their construction. If you are near one of these jobs, take the time to go and watch the road-builders at work—you'll find it time well spent.

Feb. 6—Route No. 6, Section No. 5, Shirley-Oldman's Creek, Concrete Paving Job, 6.812 miles, 20 feet wide with gravel shoulders, was awarded to the Benjamin Foster Company, Philadelphia, Pennsylvania, on his low bid of \$254,021.53.

Feb. 15—Route No. 6, Section No. 6, Old Man's Creek-Mullica Hill, Reinforced Concrete Paving Job, 5.028 miles, 20 feet wide with gravel shoulders, was awarded to the firm of M. Staub, Swedesboro, New Jersey, on his low bid of \$203,660.48.

Feb. 14—Route No. 2, Section No. 3, South Broad St., Storm Drain job was awarded to A. G. Thompson, of Trenton, New Jersey, on his low bid of \$17,665.06.

March 6—Route No. 6, Section No. 10, Quinton to Marlboro, Grading and Graveling job, 5.994 miles, 20 feet wide, was awarded to the Masterson Construction Corporation, New York City, on their low bid of \$79,793.17.

March 6—Route No. 6, Section No. 11, Salem to Quinton, Reinforced Concrete Paving Job, 2.648 miles, 20 feet wide with gravel shoulders was awarded to Joseph F. Burke, of Plainfield, New Jersey, on his low bid of \$111,833.79.

Feb. 27—Route 10, Section 1-B, Arcadian Way to Fort Lee Ferry, Reinforced Concrete Paving Job, 0.48 miles, 20 and 30 feet wide with earth shoulders, was awarded to the firm of John J. McGarry, Edgewater, New Jersey, on his low bid of \$104,362.61.

Feb. 21—Route 14, Section 5, Cape May Court House to Swainton, Concrete Paving Job, 2.987 miles, 20 feet wide with gravel shoulders, was awarded to the firm of Sutton and Corson, Ocean City, New Jersey, on their low bid of \$118,776.16.

March 8—Route 4, Section 9, Smithville-Mullica River, Warrenite Bithulithic Job, 3.748 miles, thirty feet wide, with gravel shoulders was awarded to C. H. Earle of Hackensack, New Jersey, on his low bid of \$374,533.77.

March 8—Route 4, Section 6, Eatontown-West Long Branch, Sheet Asphalt Job, 2.69 miles, 20 feet wide with earth shoulders was awarded to the Utility Construction Co. of New Brunswick, New Jersey, on their low bid of \$149,679.74.

Jan. 1—Route 6, Section 8, Pearl St., Bridgeton, Concrete Paving Job, 0.455 miles, 20 and 30 feet wide with gravel shoulders was awarded to the Tri-State Construction Company, Bridgeton, New Jersey, on their low bid of \$76,302.36.

April 5—Route 4, Section 10, Shadow Lawn-Roseld Ave. Sheet Asphalt Paving Job, 2.41 miles, 20 and 36 feet wide with earth shoulders, was awarded to Newark Paving Company of Newark, New Jersey, on their low bid of \$104,969.51.

April 4—Route 2, Section 3, South Broad Street, Sheet Asphalt Job, 0.648 miles, 48.5 feet wide, was awarded to J. J. Barrett, Trenton, New Jersey, on his low bid of \$69,433.77.

March 1—Route 11, Section 1, Main Street, Passaic, Sheet Asphalt Job, 0.257 miles, 40 feet wide, was awarded to Union Building Construction Company, Passaic, New Jersey, on their low bid of \$15,160.13.

April 5—Route 4, Section 12, Sea Girt Avenue, Concrete Paving Job, 0.162 miles, 20 feet wide with earth shoulders, was awarded to T. H. Riddle, New Brunswick, New Jersey, on his low bid of \$8,569.23.

April 4—Route 9, Section 6, Somerville-Bound Brook, Concrete Paving Job, 2.491 miles, 20 feet wide, earth

shoulders, was awarded to Salmon Brothers, Netcong, New Jersey, on their low bid of \$131,710.10.

March 31—Route 4, Section 5-A, Storm Drain in Red Bank was awarded to Chas. J. Romano, Montclair, New Jersey, on his low bid of \$15,314.85.

April 10—Route 6, Section 9, Salem-Collier's Run, Concrete Paving Job, 4.752 miles, 20 feet wide with gravel shoulders was awarded to Sampson & Reuter, Elizabeth, New Jersey, on their low bid of \$196,975.08.

April 18—Route 9, Section 5, Union Avenue, Bound Brook, Sheet Asphalt Job, 1.501 miles, 20 feet wide with earth shoulders was awarded to the Utility Construction Company of New Brunswick, New Jersey, on their low bid of \$93,090.31.

April 10—Route 3, Section 8, Camden-Clements Bridge Road, Concrete Paving Job, 3.82 miles, 36 and 40 feet with earth shoulders was awarded to W. Penn Corson, Ocean City, N. J., on his low bid of \$248,532.24.

April 10—Route 3, Section 9, Clements Bridge Road-Kirkwood, Concrete Paving Job, 3.756 miles, 29 feet wide with earth shoulders was awarded to John M. Kelley Construction Co., Camden, N. J., on their low bid of \$200,592.95.

April 10—Route 3, Section 10, Kirkwood-Berlin, Concrete Paving Job, 5.576 miles, 29 feet wide with earth shoulders, was awarded to John M. Kelley Construction Co., Camden, N. J., on their low bid of \$297,993.89.

April 14—Route 5, Section 5, Madison Ave., Morris Twp. & Borough of Madison, W. B. on Concrete base, 2.032 miles, 20 feet wide with earth shoulders, was awarded to the Northern Construction Company of Newark, New Jersey, on their low bid of \$117,444.37.

April 13—Route 15, Sections 2 and 3, Bridgeton-Millville, W. B. on Concrete Base, 8.00 miles, 20 feet wide with gravel shoulders, was awarded to the Tri-State Construction Company of Bridgeton, New Jersey, on their low bid of \$455,500.12.

April 14—Route 4, Section 14, Laurenton-Lakewood, 3.875 miles, Concrete Paving Job, 20 feet wide with gravel shoulders, was awarded to C. H. Earle of Hackensack, New Jersey on his low bid of \$144,705.68.

## Politicians Versus Frogs

When the Lee Highway delegation called on Governor Trinkle recently there was no second governor present to end the speech making by saying: "It's a long time between—".

However, Henry Roberts, of Bristol, member of the delegation, told the governor a frog story.

"There was a farmer," said Mr. Roberts, "who dropped into a hotel and found that the landlord was paying what seemed an enormous price for frogs. The farmer was interested and in response to his inquiries was told that the high prices were paid because of the scarcity of frogs. 'Why,' said the farmer, 'there are a million frogs on my farm.'"

"Bring them in," said the landlord, "and I will pay the price."

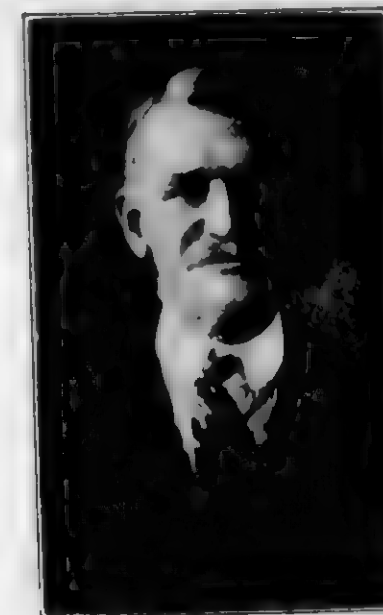
"So the farmer went back home, abandoned his crops and sent the boys and hands out to catch frogs. At the end of two days they had captured a dozen. These the farmer took to town and sold them to the hotel. As he was leaving the landlord said:

"You told me you had a million frogs on your place. 'I know I did,' said the farmer, 'but I was judging by the noise they made.'"

Mr. Roberts added that the opponents of the highway department had raised a big clamor, but that on the "show-down" they had been found lacking in numbers.

—Highway News Digest.

## "Jack" Edwards Held Up By Highwaymen!



J. T. EDWARDS  
Still Smiling  
in Spite of that Hold Up

The Jersey Journal prints the following account of blow-out given to Jack Edwards, Maintenance Supervisor of the Central Division.

"John T. Edwards, brother of Governor Edward I. Edwards, was 'held up' last night on a lonely road between Cliffwood and Red Bank, N. J., by 'highwaymen' and was escorted to Stillwagon's Hotel, where he was entertained. The 'hold-up' men represented the employees of the Central Division of the State Highway Department. The event was in honor of the return of Supervisor Edwards from a vacation spent in Florida.

"The arrangements for the event were in charge of Assistant Superintendent of Motor Vehicles, J. J. Tyman, Foreman William Hunt and Auditor A. J. Amison and Assistant Secretary to Governor Edwards A. J. Dwyer. It was a complete surprise to Mr. Edwards, who was escorted to the banquet hall and seated at the head of the table, flanked on either side by Assistant Superintendent of Maintenance Woodruff and Frank P. Jones of Hoboken, who was speaker of the evening. Alfred Kerr of Hoboken of the Maintenance Division was master of ceremonies.

"At the conclusion of the supper the evening was spent in discussing good roads, good work, and good supervision.

"Mr. Jones went into the construction of the old Roman roads of England, the mecadam roads of Germany and others of which he said have been laid for upwards of 2,000 years and were still in service. The speaker referred to the apparent unity of feeling among the employees in working for one aim, namely, better roads. Mr. Jones received hearty applause at the conclusion of his remarks.

"Assistant Superintendent Woodruff spoke of 'Concrete Joints'. He referred to himself as being a 'concrete joint' at the supper, have been called upon as a 'filler in' owing to the absence of Superintendent A. W. Muir, who was in conference with State Highway Engineer Wasser, in Trenton. Mr. Woodruff's remarks caused much laughter and won applause. He passed jokes on all present.

"Superintendent Edwards said: 'This is indeed a surprise—an agreeable one. I am in favor of such gatherings, especially if told about it previously. I could have been invited instead of being 'Held Up' on the highway by 'highwaymen.'"

"As you know I want good roads and I am going to have them if you work with me as you have in the past. I am proud of the roads under my supervision. We must work together and for the aims laid down by State Highway Engineer, Thomas J. Wasser. He is the greatest road builder and organizer in the State. I won't stand for any employee laying down on the job. He must do his work or quit.

"Mr. Edwards spoke at length on road work in this and other States. He said that the roads of New Jersey would be 100 per cent efficient before fall.

"Other speakers were Assistant Secretary Dwyer, Auditor McGowan, Assistant Superintendent J. J. Tyman, Charles Hurley, William Hunt.

## Big Blow-Out But No Fatalities

"Before the session adjourned Supervisor Edwards invited the guests to his summer home at Manasquan, N. J. for a supper, sometime in early June."

The Hudson Observer also makes mention of Jack's party in the following language.

"Supervisor John T. Edwards, of Jersey City, of the New Jersey State Highway Department, was the guest of honor at a dinner Monday night at Stillwagon's Hotel, Cliffwood, N. J. The event was given by the Central Division, N. J. S. H. D., in honor of the Supervisor's return from his vacation which, with Mrs. Edwards was spent in Florida.

"During the evening Mr. Edwards spoke on good roads and how to maintain them properly. He referred to State Highway Engineer Thomas J. Wasser, as the greatest road builder New Jersey ever had the honor to secure.

"The greatest asset the State owns today is good roads. Without good roads, the avenues of traffic are absurd. The farmer who some time ago was forced to take his produce to market with a team and farm wagon, can now be seen speeding to his point of disposal in big trucks. We see motor vehicles in competition with the railroads. Without the roads as they are, such conditions could not come to pass.

"It is true that several of the roads in New Jersey were not built for heavy traffic. They were constructed years before motor trucks were thought of. Built, I may say, in Colonial days, when a horse-drawn vehicle was the only means of travel.

"We are gradually overcoming these conditions and before fall I am sure not one of the thousands of visitors who take advantage of our highway systems will have cause of complaint. Route No. 1, from Elizabeth to Camden, cannot be equalled for the length of miles in any state. Other routes are equally as good.

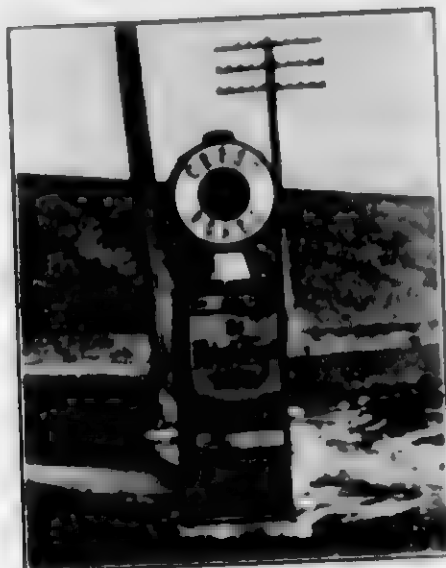
"Because I praise the roads of our State, I don't mean that you men must lay down on your work. They must be maintained and I shall insist that you keep on doing your part and maintain them. Should any of you desire assistance in the work laid down for you do not hesitate to call upon me. In order to maintain the work properly we must work together.

"Other addresses were made by Assistant Superintendent of Maintenance Woodruff; Assistant Superintendent of Motor Vehicles, J. J. Tyman; Assistant Secretary to Governor Edwards, A. J. Dwyer; Auditor Charles Hurley and Frank McGowan. Alfred Kerr, maintenance division was master of ceremonies. Representatives from each of the twenty one New Jersey counties were present."

These newspaper clippings were the first intimation we had of the affair and editorially we wish to make the same comment as we saw inscribed upon an automobile tire repair shop:—

"Why not invite us to your blow-out?"

# The Highwayman



Signs like this give the visiting motorist information as well as a "warning."

## Warning Signals as an Aid to Motorists

New Road Helps that Are Doing Much to Eliminate the Dangers of Driving

We are all rapidly becoming familiar with the "Light-houses" being placed along the New Jersey State Highway System and the subject of warning signals is, no doubt, of interest to a great many people.

A. The New Jersey State Highway Commission appreciates the importance of a State and National Signal system which shall "speak a common language."

B. With improved highway construction, increased volume of night traffic, limited headlight candle power, and the legal necessity for deflecting lens, an illuminated system of signals is required. A flashing light for use as a warning is desirable not only for reasons of economy, but primarily because such a signal is readily differentiated from any other form of illumination, and because the flashing light has a psychological effect—a positive attraction—which cannot be accomplished with any steady light.

Psychologists have repeatedly proven, that after a few seconds the human brain will not retain a distinct picture of any object thrown upon it by the eye. It is for this reason that we wink in order to give the brain a rest to reproduce a fresh image which will be distinct. The Flashing Light accomplishes this automatically without mental effort as contrasted with the diminishing effectiveness of the steady light.

C. The Standards Committee of the American Association of State Highway Officials has recommended to the various Highway Commissions a color standard which system has been adopted by the New Jersey Commission.

D. The American Gas Accumulator Company which has for more than fifteen years been developing an unwatched acetylene lighting system for marine service, has supplied this marine apparatus which is used on all of the Panama Canal lights and on 85 per cent of the marine lights now purchased all over the world. The AGA company after consulting with a number of State Highway Officials and the Executive Committee of the American Association

of State Highway Officials, has designed "Highway Lighthouses", which are sturdy of construction, economical of operation, and are applicable to every highway danger are entirely effective as a day warning, and have a flashing colored beam of light, which has a remarkable "wallop" at night. On a clear night this light can be discerned for a distance of approximately five miles. The color of the light tells the motorist the distance and the nature of the danger ahead. In addition to this as a motorist approaches within one hundred yards of the lighthouse, the illuminated wording of the lighthouse definitely describes the danger. Where a red lens is used, this illuminated wording reads "Danger Railroad", "Danger Bridge," or "Danger Stop." Where a yellow lens is used, an illuminated wording is shown with "Caution Grade" or "Caution Curve", with an illuminated dart showing whether the curve breaks to the right or left and whether it is a simple or reverse.

Where there is no fixed danger ahead, but merely a traffic intersection, a green lens is used with the illuminated wording "Cross Roads".

These Highway Lighthouses have a small pilot flame about as large as a head of a match, which burns continuously and which ignites the principle gas as supplied, which is about forty-five times per minute.

The Highway Lighthouse consumes less than two feet of gas per day if operating for a twenty-four hour period. It can readily be equipped with an AGA "Sunvalve" device which is used for the control of AGA marine lights, in which case the light will automatically be turned on at dusk, and off in the morning at sunrise.

The "AGA" Sunvalve will illuminate the signal during the day in case of heavy fogs or storms.

E. In determining the source for financing a state wide and nation wide installation of highway light-houses, and the resulting operating cost, it was apparent that one national organization could accomplish a uniformity in construction.



Much more attractive than the ordinary "Bill-board", and makes possible a real public service.

# Road Tips

## MONTHLY BULLETIN OF DETOURS

Adopted by the New Jersey State Highway Commission

Corrected to May 13, 1922

All detours posted with signs and blazed with "Arrows"

(Color signals to right will be used along all State roads as soon as possible)

ROUTE NO. 1—Greenwood Avenue near the City of Trenton.

Under construction. Traffic will detour from Greenwood and Olden Avenues over Olden Avenue to Hamilton Avenue and over Hamilton Avenue to Nottingham Way and Mercerville to Route No. 1

ROUTE NO. 3—Camden Berlin.

Traffic to the shore from Market Street Ferry, Camden, will go out Federal Street to Haddon Avenue to Mt. Ephraim Avenue, thence over Mt. Ephraim Avenue through Mt. Ephraim to Chew's Landing, Blackwood and Clementon to Berlin. Traffic from the shore will leave the White Horse Pike at Berlin going through Gibbsboro, Haddonfield, Ellisburg and over the Marlton Pike to Federal Street, Camden, thence over Federal Street to the Market Street Ferry.

ROUTE NO. 4—Eatontown-Long Branch Road and Allenhurst.

Detour at Eatontown over South Street through Oakhurst to Deal Beach.

ROUTE NO. 4—Under construction through Avon.

Traffic will be carried through construction.

ROUTE NO. 4—Sea Girt Avenue.

Short detour over local streets.

ROUTE NO. 4—Laurelton-Lakewood.

Traffic will go from Laurelton through Cedar Bridge and Silverton to Toms River.

ROUTE NO. 4—Point Pleasant.

There will be a short detour over local streets.

(Continued on Reverse)

This color (blue) on posts at signs indicates that road is running North and South

Red shows that it has East and West

White/yellow tells you that it takes a diagonal course south-east or north-west

And brown indicates that it takes a diagonal course north-east or south-west



## For You— "The Highwayman"

Do you use roads? Do you want to know where they are being built, and what detours to take, each month?

Then send, TODAY, to

The Highwayman  
New Jersey State Highway Department  
Trenton, N. J.

Just ask to be put on The Highwayman's list. A postal will do.

Continued, page 9



## MONTHLY BULLETIN OF DETOURS

### ROUTE NO. 5, Section 5—Convent Station to Madison.

Detour beginning at the corner of South Street and Madison Avenue, in Morristown, and running from thence on South Street in a westerly direction to the Morristown-Green Village Road; from thence still southerly on the Morristown-Green Village Road to Loantaka Way; thence easterly on Loantaka Way to Woodlawn Road; thence still easterly on Woodlawn Road to the Madison-Green Village Road; thence northeasterly on the Madison-Green Village Road to Kings Road; thence southeasterly on Kings Road to Waverly Place; thence easterly on Waverly Place to Route No. 5 in Madison.

### ROUTE NO. 6—Mullica Hill-Shirley.

Detour via Woodstown, Alloway and Aldine to Bridgeton.

### ROUTE NO. 6—Woodstown-Salem.

Detour via Woodstown and Sharptown to Salem.

### ROUTE NO. 6—Salem-Quinton-Bridgeton.

Detour from Salem through Hancock's Bridge, Harpersville, Canton and Rindtown to Bridgeton.

### ROUTE NO. 9—Perryville-West Portal; Hunterdon County.

Detour via Vinton, Glen Gardner, Hampton, Asbury, West Portal. 1921 work.

### ROUTE NO. 9—Bound Brook-Somerville.

Detour over the old turnpike between the points mentioned.

### ROUTE NO. 12—Phillipsburg-Port Colden; Warren County.

Detour via Phillipsburg, Bloomsbury, West Portal, Asbury, Washington and Port Colden. 1921 work.

### ROUTE NO. 12—Denville-Parsippany-Pine Brook; Morris County.

Detour via Denville, Tabor, Morris Plains, and Littleton to Cobb's Corner, Parsippany and thence over Route No. 12 to Pine Brook and Paterson. 1921 work.

### ROUTE NO. 13—Which is the Lincoln Highway.

Is under repair between Lawrenceville and Princeton. Traffic is advised to detour via Washington Street, Princeton, across Carnegie Lake and the canal to the Brunswick Pike at Penn's Neck, turning south over the Brunswick Pike to the City of Trenton. North-bound traffic will take the reverse of this route which is out Brunswick Avenue, Trenton, continuing out the Brunswick Pike to Penn's Neck just east of Princeton, where traffic will turn to the west going over the canal and Carnegie Lake through Washington Street to Nassau Street, Princeton, and turning north on the Lincoln Highway and going to New Brunswick.

### ROUTE NO. 14—Cape May Court House-Swanton.

Detour from Swanton through Avalon, Peermont and Stone Harbor to Cape May Court House.

### ROUTE NO. 15—Bridgeton-Millville.

Detour from Bridgeton via Carmel to Millville.



No more "terrible accidents" when the deadly "crossing" has been eliminated.

## The Elimination of Grade Crossings

By H. C. Shinn, Engineer of Special Assignments

Two very serious accidents which occurred recently in the vicinity of Lakewood just a few days ago at grade crossings of the Central Railroad of New Jersey, in the first of which the woman driver who was the only occupant of the closed car was instantly killed and the machine wrecked at the River Avenue grade crossing of Route No. 4 and just a few days later about a mile and one-half from this point on the Central Railroad of New Jersey, where the Lakewood-Farmingdale road crosses the railroad, an ice-cream truck was hit and the driver and one other man occupant was instantly killed, calls our attention to the serious problem presented by grade crossings.

In justice to the railroads, it is easy to see how difficult it would be for them to secure the necessary funds to eliminate all grade crossings, as it is not easy to secure funds for betterments that will pay some returns, in the form of interest. The probability of the railroads being able to secure increased passenger and freight rates in sufficient amounts to enable them to pay for the tremendous amount of money which would be necessary to use in the elimination of crossings is remote, so from their standpoint the likelihood of their being able to eliminate grade crossings is very slight. From the standpoint of the State Highway Department and the county and municipal governments engaged in road building the elimination of grade crossings presents an equally great difficulty.

In order to imagine the public opinion the Department would be confronted with, just visualize the case of the nearest grade crossing condition to you and try to estimate the large cost which would be necessary in order to eliminate it. If you react on the average way, you would probably say that the money that it would take to eliminate this crossing would build a considerable length of road and

that we need roads more than we need elimination of crossings. On the other hand, those people who have heard and seriously think about the grade crossing accidents in which lives have been lost will say that no amount of money would be too large in order to save the lives of the people who have to use these crossings.

Sometimes the Highway Department sees an opportunity to improve the alignment of the highway at the same time eliminating one or two dangerous grade crossings, at a cost, although high, which would be insignificant compared with what the cost would be in a generation from now or even a comparatively short span of years, and when measured by the loss of life of citizens well known in the community through grade crossing accidents would be considered small.

The chances are all in favor of the general public approving the re-alignment and elimination work a few years after it was done and saying that it was the only sensible course to take, but without considering all the conditions people are prone to condemn far sightedness in such matters at the time when the work is proposed or else bring pressure of public opinion to bear upon their public servants, the governing body, in an effort to prevent expenditure of State funds for such work, while as before stated the same people would without a doubt commend the action of the governing body in a very few years after the work has been performed.

The necessity for making decisions in cases of this kind is one of the duties of public officials and while they do not expect the average citizen to have and to take all of the facts into consideration in judging the action of the governing body because they do not have the time and they are not trained along these lines, but it would be a matter of great gratification to these said officials if the people in judging actions of their servants would first en-

(Continued on page 10)



This will give you some idea of the work required to "eliminate" a bad crossing—but is worth all it costs, many times over. (Route 6—entering Bridgeton, N. J.)

# The Highwayman of New Jersey

9



Drills at work in the rock on Route 10 (Fort Lee Ferry) job

## Blasting a Road in the Solid Rock

By Roy Mullins

Route 10 of the State Highway System extends from the Market Street Bridge over the Passaic River at Paterson through Hackensack to the 130th Street Ferry at Edgewater, a distance of about eleven miles. This route, the shortest of the entire State Highway System, presented the most varied and rugged construction conditions of the entire system. Section 1-A, which has recently been opened to traffic from the Ferry at Edgewater to the top of the Palisades, Section 1-B now under construction extends across the plateau on top of the Palisades, Section 2, leads down the west side of the high land to the Hackensack valley, and Section 3 carries the route across the Hackensack meadows. Thus within a distance of five and a half miles there occurs heavy rock cutting, working up the face of a cliff two hundred feet high, extensive earth fills working down the other side of the ridge, and fills across tide marshes with unstable bottom.

The work on Section 1-A was started in the early summer of 1919. The roadway as designed was thirty-four feet between curbs with an eight foot side walk on one side. The road has a maximum grade of 6 1/2%, being 5% the greater part of the way and about 2% on the curves. This part of the road is literally blasted out of the face of the rock and the road is now flanked on one side by an almost vertical cliff over 100 feet high, and on the other side is supported by a retaining wall 50 feet high.

The rock excavation was accomplished by use of five jack hammers and five tripod drills operated by compressed air delivered through a 2 in. pipe line from a compressor plant at the foot of the hill. Horizontal holes up to 20 in. in depth were drilled close to the bottom of the excavation and loaded with dynamite which was exploded by electricity, so that the charges in several holes were blown up at the same time. The rock thus broken up was picked up by three steam shovels and loaded on to cars operated on a narrow gage track which extended nearly the entire length of the work with necessary sidings,

etc. The railroad equipment consisted of forty double truck dump cars holding three cubic yards each and four twelve ton locomotives. The larger pieces of rock were delivered to cable ways, three of which were in operation in the construction of the retaining walls. These cable ways were about three hundred feet in length and were capable of lifting stones weighing several tons and placing them anywhere in the wall. As the wall was constructed, the equipment was moved ahead.

The smaller and irregular fragments of stone were deposited in an embankment which forms the north loop of the road. A stone crushing outfit was installed consisting of two crushers, elevator, screens and segregating bins to crush stone for use in concrete, which it was intended to use as permanent. However, after about three thousand tons had been crushed it was determined that stone could be delivered from commercial plants to the job cheaper than it could be crushed at this plant. The excessive cost of crushing was due to the difficulty of getting coal up to the plant, the necessity of rehauling the stone from the plant to a storage pile and the interference with the progress of the steam shovels.

The excavation and construction of the walls and drainage system was carried on continuously over a period of nearly two years. The maximum force employed was 125 men and an average force of 50 men was at work all of the time. In spite of the fact that this large force of men was concentrated in narrow confines where dynamite was used, it is a remarkable fact that no lives were lost and no serious injuries suffered by the men or damage done to property.

The original contract included the excavation, drainage system, the bridge and also a stone block pavement for the road. However, as work progressed it became apparent that the road would continue to settle for some time, and it would be inadvisable to build a hard pavement which would crack badly as the fill con-

tinued to compact. For this reason the hard surface was eliminated from the original contract and a new contract let for the construction of a temporary bituminous macadam pavement which makes the road available for use and which can be maintained without difficulty until the fill has ceased to settle. This opens a new road from the Edgewater Ferry to Anderson Avenue, which is one of the main roads in this vicinity, and makes it no longer necessary to use the steep road leading to Fort Lee.

Section 1-B of this route now under construction will have a reinforced concrete pavement. This is a relocation of the route which has been adopted to divert heavy traffic from the high class residential section through which the route now runs.

Section No. 2, leading down to the Hackensack Valley, has been graded and contracts are to be awarded for the construction of the pavement and necessary bridges.

Section No. 3, leading across the meadows about two miles in length will probably be constructed during the present summer.



Under conditions like these, the operator has no cinch—but we found this one smiling!

## Warning Signals as an Aid to Motorists

(Continued from page 6)

struction and economy in the cost of installation and maintenance, which could not be obtained by various municipal organizations. It was also apparent that any moneys used for this purpose would limit road construction and road maintenance by that same amount.

It was also determined that with all the agitation and legal action against billboard advertising along the high-

ways, that this type of advertising was developing an ever increasing rate and unlike any other type of advertising, was not being "harnessed" for some public service.

The Highway Commission believes that by offering to national and local advertisers the privilege of advertising space on highway lighthouses, which shall be located along the roadside, it will accomplish a three-fold result:

1. Secure for the public an illuminated safety system of a character and scope which could not be financed by the State at the present time with the option of taking over this system and removing the advertising at the pleasure of the State.

2. Divert advertising appropriations to this public service which otherwise would be applied to the construction of additional billboards.

3. Govern the nature, character and size of the advertising appearing along the highways so that its subject matter will not be objectionable, its design will be pleasing, and its size will be unobtrusive.

F. The Highway Commission has for that reason contracted with the American Gas Accumulator Company of Elizabeth, New Jersey, and its subsidiary, the Highway Lighthouse Company, for the purpose of safeguarding the primary road system at no cost to the State, and at the

## Highwayman Attends Officers Training School

Mr. E. R. Sherbaum of the State Labor Division, who was selected to attend the officers training camp of Artillery Officers at Fort Sill, Oklahoma, has now resumed his duties with the State Labor Division. Mr. Sherbaum attained a very high record in his class and received a commission as Captain of Field Artillery in the Officers Reserve Corps.



Here's real work for a steam shovel! Taking up a dipper-ful of "coarse gravel". When the chunks are too big for the dipper, they are loaded as shown at the right



"Blasted out of the solid rock"—that's how they did the grading going down to the ferry. The approach and the loop, just above the ferry.





same time indicating on the side of highway lighthouses, the route number by an illuminated figure, and mileage and directional information.

Highway Lighthouses are being installed by the Highway Lighthouse Company at locations designated by the Commission, as rapidly as possible and have already proven their effectiveness in avoiding accidents. Since the installation of these lighthouses at a large number of the most dangerous points on our State roads, we have not a record of an accident resulting in deaths or injuries at any of these locations. While a continuation of this perfect record cannot be hoped for, there is no doubt in the opinion of the Highway Department that a State wide installation of highway lighthouses will result in a very decided reduction in the loss of lives and property.

The State is obligated to furnish its available police protection for the safe-guarding of these lighthouses. It is the desire of the Commission that any occasional vandalism or abuse be promptly reported to the State Constabulary and this office.

#### Extracts from the Report of the Committee on Standards of the American Association of State Highway Officials Convention, Washington, D. C. December 13-17, 1920

Having in mind the necessity for an early adoption by the Associations of standard colors for highway warning signs and devices, the Committee submits the following color scheme as a tentative standard for such studies as may be necessary during the coming year.

**RED:** Indicating first degree danger to be used only at railroad crossings, dead end of roads, or lift bridges. All traffic to stop and proceed only when nature of passing the danger or of overcoming it has been ascertained.

**YELLOW:** indicating second degree danger, at curves and grades. Yellow would indicate a danger where the driver must slow down and proceed with caution.

**GREEN:** indicating moving or traffic danger only and to be used at road intersections.

**WHITE:** indicating a clear roadway.

#### Precautionary Signs Maliciously Damaged

We have been informed that Lighthouse No. 8045 on Route No. 10, east of the Saddle River Bridge, had been damaged by someone with evident malicious purpose, as the lens had been stoned until it was broken, in spite of the fact that extra-heavy grid was placed over the lens in the hope that it would put a stop to such damage. It has been a common nuisance to the Department and other persons who erect signs for the benefit of the traveling public to have these signs damaged or broken up by people who use them as targets to practice on, by boys who do it for unaccountable reasons and by others for one reason or another, and who have no conception of the seriousness of their offense.

In order to stop this practice the State Police have been requested to be on the look-out for violators of the law who damage such property. The following letter was addressed to Col. H. Norman Schwarzkopf, Superintendent of State Police:

April 12, 1922.

Col. H. Norman Schwarzkopf,  
Supt. of State Police,  
State House, Trenton, N. J.  
Dear Col. Schwarzkopf:

The State Highway Commission has an agreement with the American Gas Accumulator Company providing that the Company will erect cautionary signs, also known as highway lighthouses, at dangerous points throughout the

State. This is done by the Company at no expense to the State Highway Commission due to the advertising which is sold by the company.

We have received reports of one light-house in particular located on Route No. 10, east of Saddle River Bridge, known as No. 8045, which number is found on one side of the light-house. An investigation made by the Company shows that the lens in this light-house has been stoned until it was broken, although the lens are protected to some extent.

It is understood that this light-house is in the center of a foreign colony and your co-operation is requested in order to prevent a repetition of such an occurrence at this particular place and also to protect the light-houses in other sections of the State from similar abuse.

We will appreciate your co-operation in this connection.

Very truly yours,

E. J. WASSER,  
State Highway Engineer

#### The Elimination of Grading Crossings

(Continued from page 7)

deavor to secure the fundamental facts entering into decisions of said officials, thereby assisting in the public work in which we are all interested.

H. C. SHINN,  
Engineer of Special Assg.

#### Grade-Crossing Elimination

At the last annual meeting of the American Association of State Highway Officials, Neb., A. R. Hirst, State Highway Engineer of Wisconsin, read a very interesting paper on the subject "Safety and Beauty on Road Design and Construction." From this paper we quote the following bearing on the subject of railroad grade-crossing elimination:

After the curves and narrow surfacing comes the next most prevalent cause of highway accidents—the railway grade-crossing. The only safe grade-crossing is one which has been eliminated. Many accidents testify that all forms of so-called crossing protection fall down, even flagmen and gates. In planning new main highways every possible effort should be made to secure the elimination of all grade-crossings. Much can be done usually in re-locating the highways so as to avoid crossing the railways at all. Where two crossings with the same railway lie within five miles of each other, it will usually be cheaper to buy a new right of way on one side of the track and grade and drain it, than to separate the two crossings. If, however, there is something which must be met on the opposite side of the track, such as a village or city, which it is necessary to accommodate, this course may not be feasible, although quite usually between the two crossings some point can be found where a separation can be made accommodating traffic to and from the city or village in question, while the main line of traffic is left free.

Each case must be decided upon its merits, but both undergrade and overgrade crossings have disadvantages in alignment, and the best solution in four cases out of five, where the crossings are not too far apart, is to relocate alongside the track. Where a highway must cross a railway an overhead is usually superior to an undergrade crossing for several reasons, and is usually less expensive.

Up to recent years about two out of three grade separations built by the railroads have, in reality, been more dangerous to highway traffic than the grade-crossings they replaced, because the railroads paid no attention to the matter of highway alignment, and in almost every case used crossings perpendicular to their tracks with too sharp and sometimes blind approach curves. Such crossings are seldom, if ever, satisfactory where the highway is in general paralleling the railroad as many main highways naturally do, and when skew crossings have to be built, the decision almost inevitably falls upon relocating the highway.

#### The Engineers

Into the wastes of the desert,  
Into the mighty hills,  
Unheralded, lonely, courageous,  
Dauntless to work their ways,  
They fare them forth in the dawn  
In the light of the flaming sun,  
And weary they sink to slumber  
When their day of toil is done.

They are not bound to the glories  
That ad about them dream,  
The sunset, the moonlit mountains,  
The fish that leaps in the stream,  
Nay, rather they seek a vision,  
In the burning desert sands,  
Of cities rising to splendor,  
Where the desolate cactus stands.

They dream of busy cities  
And homes for their Jesus men,  
Of laughter and tears and children—  
And they rise to work again,  
They tunnel the depths of the mountains,  
They wade through the sinking bog,  
They freeze in the icy winter,  
And toil in the heat and the fog.

I think, when the mountains are crumpled,  
And the ray of the last, red sun  
Looks down on ruined nations,  
And the glories of earth are done—  
I think, in the hush of the silence,  
When the cycles of life are run,  
There shall come to the men who have labored  
The sound of a voice: "Well done!"

—HERBERT EDWARD MIEROW.

The author of the above poem was a brother to the late Frederick C. Mierow, who was employed as an Assistant

Engineer by the Department, and was well-known and liked by men of the Central Division and the Right of Way Division. Mr. Fred Mierow spent a great deal of his engineering life in work in the West, meeting conditions of the Field Engineer from which we imagine his brother has gained his idea of the "Engineer." Mr. Herbert Mierow is now taking a post-graduate course in the Graduate College at Princeton University. He has spent sometime as Assistant Professor in the Department of Classics, Colorado College, Colorado Springs, Colorado. There are few writers who see the romance and serious purpose in engineering life. The Highwayman wishes Mr. Mierow further success in his literary efforts.

#### Sharp Turns

By JAMES W. BROOKS

From the Highway News Digest

More rigid specifications for public service would exclude a lot of faulty human material.

It's a short road—very short—that has no political turn.

One of life's riddles is why the road critic who doesn't know what he is talking about is so anxious to tell everybody.

Waiting for the sun to make roads passable after every rain, when good engineering will do it once and for all, is another fool occupation.

Good roads pay in bad weather, while bad roads waste, even in good weather.

The average man who opposes an increase in taxes to decrease waste on roads has a one-track mind—and the switch is thrown on that most of the time.

Less mileage and more wear leads to more mileage in the long run, since roads that are built right stay right.



In front of Seaview Golf Club, near Atlantic City, (Route 4)

#### Warrenite—Bitulithic Pavements Have Stood Up Under Heavy Traffic For 15 Years

The test of the paving is in the riding—and the cost of upkeep. Upon either of these points we invite your critical investigation. Some of the oldest paved roads in New Jersey were laid under the Warren patents. Many of these have been in constant use under heavy traffic for fifteen years. They are still in excellent condition.

"The Best Road You Can Buy Is the Cheapest in the End."

Warren Bros. Company

District Office 50 Church Street, New York City, N. Y.



Next Time You Have Cement Trouble  
Get Wise to "Dragon"

Not that we make all the good cement in the world—we don't!  
But what we do make is good. It's absolutely dependable.  
And along with its dependable goodness, there is our dependable service.

We make a point of shipping promptly.

That's why so many contractors who are old hands at the game have turned to "Dragon"—and stick to it.

"For Cement you can depend on—use Dragon"

**Lawrence Cement Co.**

PHILADELPHIA

303 Broadway, NEW YORK

## Concrete Roads Add Years to Your Car's Life

Dust, mud and splatter, the rack and strain on the mechanism from bad roads, all cause rapid depreciation from the day you start driving.

Concrete hard-surfaced roads are clean, dustless, even, firm and skid-proof in all kinds of weather. They add years to your car's life—help to keep it at top value for service, exchange or sale.

*Our Booklet R-3 tells other interesting things about Concrete Roads. Write for your copy.*

**PORTLAND CEMENT ASSOCIATION**

347 Madison Avenue, New York

A National Organization to Improve and Extend the Uses of Concrete  
Offices in 23 Other Cities



# GLUTRIN

## Four Reasons Why All Gravel Roads Should Be Treated With Glutrin

First: Glutrinized gravel roads are hard all the year round.

Second: Glutrinized roads shed water—and for that reason they do not rut up during the winter and Spring.

Third: Glutrin is the best binder yet discovered for gravel stone, sand-clay, or slag or earth roads.

And finally: Glutrin is not only the best binder, but by far the most economical.

### What Local Authorities Think of Glutrin Road Binder:

*Taken from the Daily Pioneer of Bridgeton, N. J., Tuesday, February 14, 1922*

#### "SHOWS VALUE"

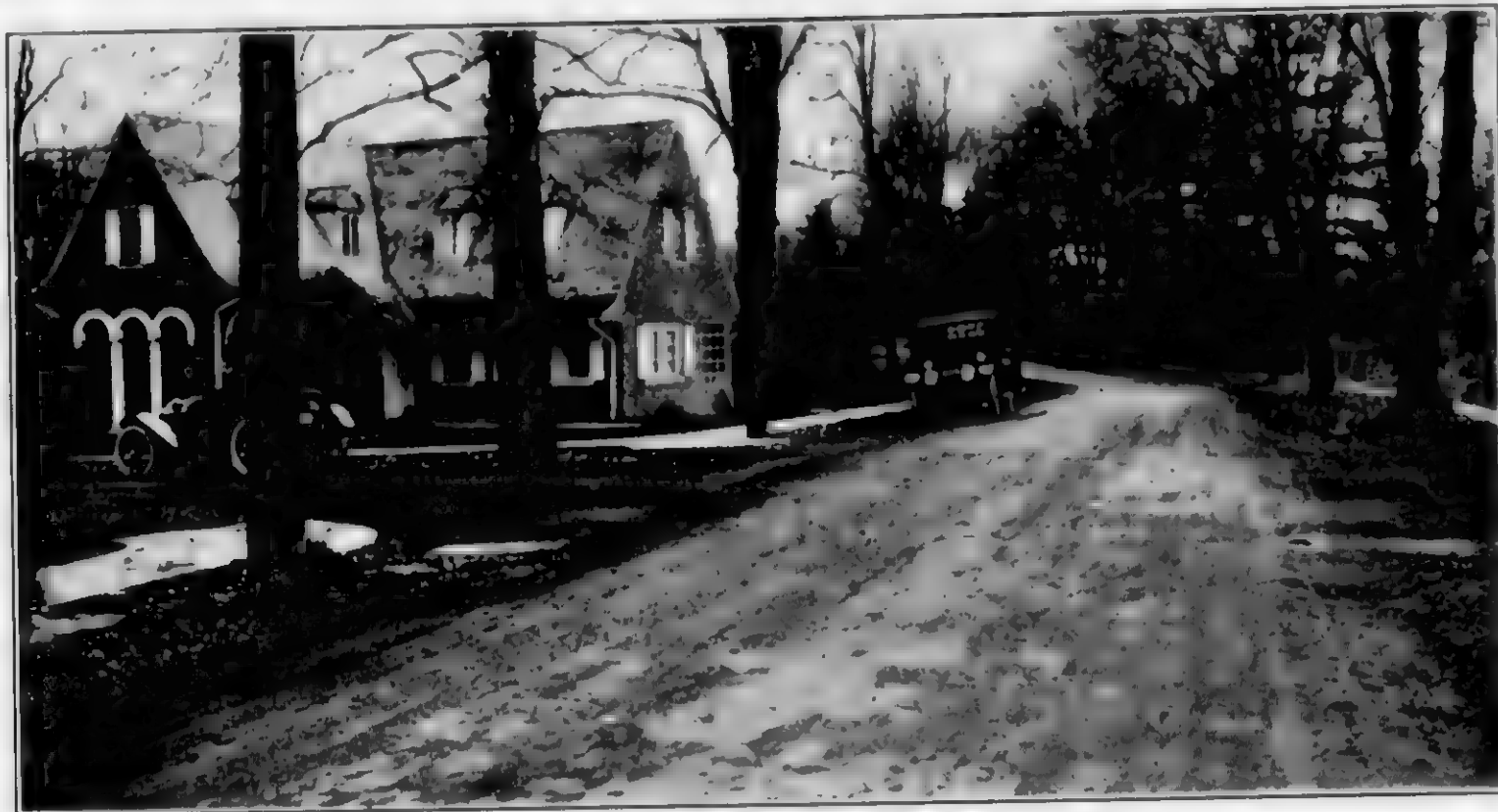
"Last fall the state highway department caused west Commerce street to be flushed with glutrin, an oil-like preparation which has for its object the laying of the dust and preventing the gravel on the roads to be cut up with the traffic. The glutrin application also has had the effect of giving the street a surface which turned much of the water, and the results show a very much improved condition this winter. While most of the gravel streets are soft with mud, west Commerce street is comparatively firm and free from mud, and much smoother in consequence. The experiment would seem to indicate that the glutrin application greatly improves dirt roads."

Glutrin has been manufactured by us in our own plants for over 15 years. We have our own tank car line in which to deliver the product. The material used in New Jersey was applied by Mr. M. R. Young, Trenton, N. J., with pressure distributors especially built to handle this product.

Send us your name, and let us put you next to Glutrin!

**Robeson Process Company**  
Fifth Avenue Building, 200 Fifth Avenue, New York





Springfield avenue, Summit N. J., constructed with "Tarvia-x" in 1915

## As Good As New After Seven Years Of Service

After seven years of heavy traffic, the Tarvia Penetration pavement on Springfield Avenue, Summit, is today as smooth and firm and trafficproof as when it was first constructed. This road has come unscathed through the freezes of seven winters, the thaws of seven springs, the grind of seven years' continuous usage.

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No highway engineer or road official should be without a copy of our latest manual, "Road Maintenance with Tarvia". Our nearest office will send free copy on request.



(Courtesy Portland Cement Association)

## "Vulcanite"

*A single word---But it Speaks Volumes!*

It speaks volumes, because of the things which are back of it.

First, Portland Cement, than which there is none better made anywhere in the world.

Second: a reputation for prompt service—a reputation which we jealously guard.

Third: our giant plant at Vulcanite (Warren County) with its capacity of 2,000,000 tons a year.

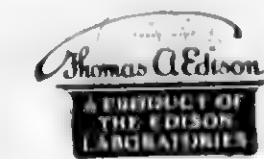
*"Let's get together and talk Cement"*

**VULCANITE PORTLAND CEMENT CO.**

PHILADELPHIA

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Next Time You're Held Up For Cement  
Remember That

Edison Can Ship 150 Cars A Day

There are several things which may hold you up on your road work.

But if you are held up for cement—it is your own fault. Edison—with trackage and packing houses so arranged that twenty-five cars can be loaded at one time—is equipped to ship one hundred and fifty cars each working day! Furthermore, we are producing cement right here in New Jersey.

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# ALONG THE ROAD



RECD. JUN 13 1922  
FILE  
FILE

## Safety Does Come First

## Danger Ahead

*The Old Mill (Route 13, Kingston, N. J.)  
When you're out driving and come to a beauty spot such  
as this—"stop—look—and listen!"*

The statistics of automobile accidents continue to pile up alarmingly.

But every careful investigation goes to prove that the great majority of them could have been prevented. A certain number are real accidents—they could not have been foreseen or guarded against.

Still more are due absolutely to darn-fool reckless driving.

But the biggest class of all are due to ignorant carelessness in not knowing, or using, SIGNALS.

The signals shown below are coming into nation-wide use. They are simple, easily memorized, and effective.

You owe it, not only to yourself, but to your fellow-motorists, to learn these signals—AND TO USE THEM.

"A word to the wise"—should save many repair bills and funeral expenses.



Boy:—"Dad, what do you call a man who drives a car?"  
Pop:—"That all depends on how close he comes to hitting me!"



Talk is not cheap to the taxpayer who permits his acts in road matter to be governed by the wrong kind.

Speaking of white mule, two rustic sports were uncertainly flivvering their way home from the county seat.

"Bill," said Henry, "I wancha to be very careful. Fir' thing; y'know, you'll have us in a ditch."

"Me," said Bill in astonishment. "Why, I thought you was drivin'."—Exchange.



In the old days when a man wanted to commit suicide, he blew out the gas. Now he steps on it.



### He's Not the Only One

A fellow who hailed from Oshkosh,

Had about as much brains as a squash,  
All corners he'd round with two wheels off the ground,  
And now he's an angel, b'gosh!



### The Passenger Critic

There is one pest I fain would swat,  
Lambast and skin alive;  
It is the cuss who sits in front,  
And tells me how to drive.



Memorize these signals NOW! They may save your life—or some one's else—some day.



Route 3, Absecon-Egg Harbor

June  
1922

## Road Builders' Supplement

Vol. I  
No. 11



Not less important than the rails of steel is the modern hard-surfaced highway in carrying the nation's traffic. "Menlo Park Cut"; Route 1, Section 3

## Roads

The Honorable James H. MacDonald, former State Highway Commissioner of Connecticut, was one of the pioneers in the good roads movement in this country. He helped organize the American Road Builders Association. His talk on the development of roads in this country is just as interesting to the layman as to the engineer. Read it!

## Note

The papers presented at the recent Convention of the New Jersey Highway Association, and the discussions following them, are such a valuable contribution to the progress of road-building that it has been decided to publish them in full with as many as possible of the charts and illustrations used. (It has not been possible to include all of these, however, so there are occasional references in the text, to photographs and charts which have not been reproduced).

Our aim is to publish one or two of the Convention papers, with the discussion thereon, each month. We suggest that these be carefully filed, so that the reader may keep the complete set, which will make a very valuable addition to his road-building library.

This month we are printing "Highways", by Hon. James H. MacDonald, Former State Highway Commissioner of Connecticut; and also "Precautions Necessary for the Proper Application of Glutrin to Gravel Roads", by Maurice R. Young, Contractor. Next month there will be published "Improvements Made During 1921 in the Construction of Concrete Pavements", by L. N. Whitcraft, Portland Cement Association; and the discussion thereon at the convention; also "Maintenance of Macadam Roads", by W. A. Van Duzer, Assistant Maintenance Engineer, Pennsylvania State Highway Department; and the discussion thereon at the convention.



# The Highwayman of New Jersey

## "Highways"

By

Hon. James H. MacDonald

(Former State Highway Commissioner of Connecticut)

CO. WILLIAMSON: It gives me pleasure, gentlemen, not only to introduce the next speaker, Hon. James MacDonald, former State Highway Commissioner of Connecticut, but to also announce that he is an honorary member of our Association.

MR. MACDONALD: Mr. Chairman and Fellow Delegates, I hardly know just what to say about this whole matter. It is ancient of days, and I had understood from Brother Wasser that the gentleman bearing the same name as I do—a little more acceptable, however, the Director of the Public Works at Washington, was to have this for a subject, and I only learned upon the arrival of the little program that the substitution had been made. So I appear here as a sort of disappointment.

"Highways" is ancient of days. It is a large subject to treat of by an elderly gentleman, and yet they tell a story about a MacDonald who was an Austrian prisoner. He got talking with one of the Austrian Officers, and he, of course, like all MacDonalds, was rather proud of his ancestry, so they began telling about different things connected with the early days. He happened to speak about the flood and Noah. The Austrian Officer remarked that he had looked over the list of those who came over in the Ark and did not notice anyone by the name of MacDonald. "Well, you know," the prisoner said, "The MacDonald's would never go with such a crowd. In those days the MacDonald's had boats of their own." It gives us a little antiquity.

I am not a stranger to New Jersey nor its history. I have been highly honored by your Civil Service Board for several years, examining your candidates for highway construction,—some three hundred,—and I am very proud to be here today as your guest and also as a brother member, as I understand that you have voted me as an honored member of your splendid Association. I am also delighted to be here by reason of the fact that probably I am the oldest Commissioner, in point of service to my State, in the country. Hence, I am delighted to be here to speak to you today in the Mother State that started this great movement throughout the country.

New Jersey was the first State in the Union to adopt "State Aid", and I am proud to say that I have known all of your Commissioners from Mr. Budd down to the gentlemen who so acceptably fill the office of Commissioner today, and I have been a personal friend also of Mr. Robert Meeker, who serves you so acceptably in his new position. I think Mr. Meeker was at our Convention of the American Road Builders Association in 1904, and has been closely identified with the movement ever since. I enjoyed the friendship of your Commissions, so I feel very much at home, in fact, when I come to New Jersey I find myself involuntarily looking at my feet to see whether I am in my house slippers or my patent leather shoes, I feel so very much at home.

Several years ago, they tell the story, that there were some miners who, upon hearing there was gold on a desert island, went there in search of it. They dug over the entire island, disturbed the entire surface, looking for gold, and came away disappointed. They did not find any. The birds of the air came and brought seeds of pomegranates, grapes, figs, and so forth. The whole island, which was then a desert, blossomed as a rose and bore fruit luxuriantly. The miners builded better than they knew. New Jersey, when she started this movement thirty years ago, builded better than she knew. This great coun-

try owes a debt of obligation to this great little State that it will be very difficult for it ever to repay. I know that when I started in my own State to construct highways, it was not as it is today. We had not gotten very far from the early days of building roads. They had not learned to disassociate intelligently and economically the money placed in the hands of the several members of select men, some 750 men. They changed every year 60 or 70.

I shall never forget when I started in 1895 as Highway Commissioner of that State, little dreaming of the great task that was before me to bring these people out of the darkness into the light and let them see the error of their ways, to build roads that would be economical roads,—roads that would stand the effects of travel and be economical to their interest. The attitude when I went into the several towns was very antagonistic. As a little illustration of how I was received—indeed, how a good many early Commissioners who started in the early days were received, I would like you to hear a little introduction I had in a small town in my State. They had a Doctor in this town who was a graduate of the University, who evidently preferred being a big toad in a little puddle than a little toad in a big puddle. He introduced me in some what the following manner: "Gentlemen, we have gathered together for the purpose of discussing this good roads question. As for myself I do not know anything about it, but I have talked with gentlemen who do know something about it, and they told me this is a political job, gotten up to furnish some politicians with a large salary and nothing to do, and I am happy to say we have with us the Chairman of that Commission, who will now address you."

I remember we were very well content to take the \$75,000 that was for use over the entire State—what some States are now spending on a mile of road, take that \$75,000 for 168 townships, 8 counties and distribute it intelligently, so as to build roads economically as a start. In some towns—I know because I had the apportioning of the money—we had to take \$5,000 and divide it up into eight or ten parts, putting a little wooden culvert in here, taking out a large rock there, taking out a sharp curve at another place, or some little thing to gradually bring the people into accord with the movement. So it went on, opposition on all sides until finally they began to wake up and see the dawn of a new day.

So today I find that it is a great deal like MacPherson looking for his relative. MacPherson went up to the Sergeant of a certain regiment and asked if there were any MacPhersons in the regiment. The Sergeant said, "We have about 150 MacPhersons." "Well," he was asked, "Have you any by the name of John?" "We have about 100 by the name of John." "Have you any with red hair?" "We have about 80 with red hair." "Have you any with one eye?" "We have about 50 with one eye." "Have you any with the itch?" "Oh, Lord, the whole regiment has it." That is about the way this movement occupies a thought with the people of today. There is no question at all about the popularity of the movement, the same as the little fellow who never saw his grandfather or grandmother. His grandfather had died and his mother told him one day that his grandmother had come to see him on his birthday. Johnny was washed up and fixed up. His grandmother said, "Well, Son, I think I am your grandmother on your father's side." "Well," said Johnny, "Grandmother, you'd better wake up, you're on the wrong side."



Roads like this have revolutionized the tremendously important business of transporting you from one place to another, quickly, safely and conveniently.  
Robbinsville Windsor, Route 1, Section 3

Anyone who takes opposition to the movement, would be taking the wrong side.

Take as a good illustration with what we have to say regarding this great movement, a bar of iron worth \$5.00. Make it into horse-shoes and it will be worth \$12.00. Make it into needles and it will be worth \$350.00. Make it into pen-knife blades and it will be worth \$3,000. Make it into watch springs and it would be worth \$250,000. The same \$5's worth of iron! It requires a great deal of hammering and pounding and polishing to bring it down to the difference between the horse shoe and the spring in the watch. So I take this great movement which means so much to the people of this country, that you can take your earth road and put it into the position of the horse-shoe worth \$12.00. You can take your gravel road and put it in the position of the needles worth \$350.00. You can take your macadam road and put it in the position of the blades of the knife worth \$3,000, and take your higher class roads and compare them with the \$250,000 or watch springs. Each one, in their turn, has accomplished that for which they were intended. I do not discredit a good earth road, I do not decry in any way the construction of a gravel road, nor do I lose sight of the fact that I have built many many miles of splendid macadam roads, and I could have entered into the discussion this morning very acceptably by saying the last official contract I let was to put another surface upon a macadam foundation. I do not propose to in any way assume a partnership with any of the people who are and have been represented on this platform, but the purpose of my little talk is not to be antagonistic or to treat any pavement unfairly, but in the discussion of this question I propose to say those things that have come to me, that in my official work have commended themselves through a long life of active, close association with this good roads movement. So close that I need only allude to one incident, not in a vain glorious spirit, but as a school that I have been allowed, in the long years of my life to attend. I was one of the original organizers of the American Road Builders Association, when there were only five of us to organize that great Association. Nearly all through the existence of that great Association I have had as a companion in my work my friend and your official, Mr. Meeker.

I have lived long enough to see that original five in the organization of that Association grow into one of the greatest conventions ever held in the history of the world, last month at Chicago. Over \$300,000,000 in machinery and in material organizations occupying 70,000 square feet of space to make the exhibit, with an attendance of 5,000 people at their sessions. Not to say anything about the

propaganda that the Association has been a part of all over the United States, from the Atlantic to the Pacific, from the Lakes on the north to the Gulf on the south, and the great number of people who have been administered to directly by the delegates and members of that Association, so that in discussing this question I simply take the education and the experience that has been presented to me by close personal contact.

A macadam road, when properly built, is a splendid road to take care of the traffic that it can sustain. A gravel road is a good road to drive on and will take care of the traffic it has to sustain, and when properly built is one of the most satisfactory roads and one of the most resilient roads, and when properly constructed and given the maintenance it is entitled to, will give the greatest service and be the equal of any road that is constructed. And so with the earth road. I remember, and many of you will remember, that when we started this great country that the people all settled at the water side, the river, the lake, and the ocean, and that was the only place that they could settle, and they moved from place to place with the roads. This great country was a wilderness, and from its earth and rock, roads have grown one of the most wonderful machines on the earth, and those rocks have been made to give up greater treasures than ever possessed by the Queen of Sheba. So take your hat off to the early settlers and those gravel roads.

This country was made by this transportation from the depths of time to grow into this great nation that it is. Since then, when we come to 1900, when we started to build this great system that we occupy today, and spend millions of dollars, we have to remember that we are not as far ahead of the dirt road, the gravel road, or the macadam road, as we should be with the waste of money, the experience and the foolishness and folly of wrong construction. They did not know how to build roads, and if they had had that degree of intelligence that we have, they would have known the material from which to build these concrete roads.

We are spending today thirty, forty, fifty and often seventy-five thousand dollars for a mile of road. For a mile of road! Outside the city of Washington there is a road from eight to ten miles in length completed by the Army Engineers during the war that cost \$75,000 a mile. What would they have done if they had had the money at that other time I speak of to build the roads. So I say, as the country town, so the city streets. Highway officials on the city streets have nothing

# The Highwayman of New Jersey



Traveling a road like this, one is able to take in the beauty of the passing landscape. (Note the color band on pole at right, which informs you of the direction in which you are going.)  
Forward Windsor, Route 1, Section 3

to say in regard to the construction, to the foolish construction, so called, that has been done in the country towns. Had our cities here in the East built their city streets like the city streets of our Western States are being laid out today, of which every street constructed would have its building line established before they put anything on it. How many times have you gentlemen seen, even in your own state, pavements that were only suitable to be put on a commercial street, and a business street laid on a residential street and vice versa, simply because someone in power wanted a fine smooth, noiseless pavement in front of their own shop. The engineer in charge was not always to blame because he was compelled by the position he held and controlling interests, to pass judgment against his own opinion to the contrary.

"Each man is a world to other worlds half known;  
Turns on a tiny axis of his own;  
His full life's whiff is a pathway dim;  
To brother planets who revolve with him."

So I say when we speak of one part of our country, let us line up the city street as well as the country road. There is another thing we do not want to lose sight of, and that is this, that in the building of our roads we are simply extending a city street. Starting at the farm-yard door, the little farms were cut up, the passageway was made after the property became more valuable. Encroachments were made. So many of our country roads are wider today than our city streets, with great congestion of traffic. Let us see to it that what we do in the future with the great amount of money placed in our hands, that we build our roads wide enough to take care of the traffic. Let us see to it that the foundation upon which these roads are constructed are deep enough to carry the traffic. We know what the traffic will be. There is no excuse now. We want good foundations but do not build your foundation any unnecessary depth to take care of traffic. But if you find you have 5, 10, 20 tons to carry, do not put your foundation 6 in. or 8 in. deep, put it in 12 in., 15 in. and 18 in. deep, if necessary. The surface is a simple matter in the end. In all highway construction in the State of Connecticut, I spent 65% of the money in my hands for the acquisition of right of way, on the question of drainage of the road, and the question of cutting back, that is the sight line, so the line of vision extended for the future and it was a very wise provision when we came into these war times, because my splendid successor, Charles Bennett, would have had very much more difficulty if he had had to build roads with labor at that time. I paved the way for the future. To take care of the alignment, I would recommend not less than 20 feet on main highways, with no shoulder less than six feet. There is no

question about that today, and we have to have it. I am glad that Mr. Meeker is in the Right of Way Division and I hope the State will place in his hands sufficient money so the people will be glad to give the right of way and start here in the Mother State to build roads so that they will be standards for every State in the Union.

I sometimes extend my talk a good deal longer than I intend when I am on this subject. Regarding the question of bonding! You can give some men all the money there is in the Bank of England. It would make no difference to those men; it would be wisely expended, economically expended and carefully thought out. You could give other men a less amount of money and every penny of that money would be carelessly spent. My own idea about that matter is that they should settle on the money in connection with this bonding scheme. No bonding scheme in the world ever should be longer in its life than that for which the money was appropriated, whether a road or a building. I am a great believer in paying as you go. It is a good thing. Just the same, I am a great believer that every road should be built to carry the load. There is no question about that.

I remember that we used to have a trial test to see whether an automobile could make a hill and established a maximum grade of 5%. Today there are grades of 5, 10, 15 and 17% that are not prohibitive. The question of the future will be foundations, width of road, sight line, drainage, and I believe the best foundation that anybody can build today to take care of the present day needs is to go back to the ancient road and construct a well-built Telford road that will stand any surface put on top of it, built the same as we built them years ago and built the same as you build them here. Have the foundation not less than 12 in. deep. Lay the stone in courses. Break the joints and wedge them good and solid. I have no use for a flat road. Give it the same crown as on the outside top. Don't let the water get under your pavement. There should be plenty of such drainage and see to it that when you build your roads, you put everything in good condition so that it will be in keeping with the material with which it is incorporated.

Inspectors on the roads in the United States are not adequately trained and not carefully trained. Not many states do as you do here in New Jersey, bring inspectors up before your Civil Service Commission. I was retained by your Civil Service Commission to examine some 300 candidates to give them the benefit of my experience and pick out the best men and make the oral examinations a test of ability and to properly impart road construction in your State. Unless you do this, you are always going to be in danger of faulty inspection. I am not going to say any



Like the bed of a railroad, the modern highway is banked at the curves, to protect both the traveler and the surface of the road. (Route 13, Section 1.)

more. I always try to say some particular thing so it will remain in the minds of my hearers and do a little good. I hope some thoughts advanced may have accomplished that result. I thank you for your kind attention.

COL. WHITEMORE: I feel sure we are all very much edified at this eloquent presentation of the thoughts of Mr. MacDonald in connection with highways. It is an old saying, which I think you will endorse in this instance, when you will also agree that "Out of the fullness of the heart the mouth speaketh." A man must know what he is talking about to be so eloquent in presenting his ideas, as the speaker who has just finished making his address.

I would like to emphasize a remark made by Mr. MacDonald, which is to the effect, as I gather from his words, that of the many elements that enter into the construction of the highway there are only two that are permanent. That is, the location and the drainage. They are the two elements that are nearest to being absolutely permanent and it is well for us all to try to keep in mind those facts when we are called upon to determine where a road shall be located and how it shall be built with respect to its line and profile. I think we are to be heartily congratulated that we had the opportunity of listening to a man of such wide experience and eloquent powers of presentation of his ideas.



## Glutrin for Gravel Roads

### And the Precautions Necessary for Its Proper Application

By Maurice R. Young

For many years the value of Glutrin as a road binder for gravel, sand-clay and stone roads has been recognized by the Highway Departments of the various states, and today, it ranks among the standard materials for use on these types of roads. However, little has been written about this material and increase in its use has been due more to the successful results secured than from any publicity campaign.

The base of Glutrin is sulphite cellulose extract, which is a product of the pulp mills and is obtained from the digesters after the wood fibre, known as cellulose, has been removed. This cellulose liquor, as it comes to the Glutrin plant, is of about the consistency of water. It is run into tanks and treated under a special process to remove acids and other injurious materials, which might be in the basic product. After this purification the liquor is run into huge evaporators where it is condensed to a density of 35 Beaume, which is 50% solid.

It is necessary to exercise great care in the preparation of this product so as not to destroy the organic matter, as it is this which makes it of great value as a binding material.

Regardless of whether a road is built of stone, gravel, sand-clay, or earth, there must always be an adhesion or bond between the particles or pieces that form the body of the road and the surface. The strength of this bond varies according to the material employed and the care used in building. Upon the strength of the bond depends the value of the road, and, therefore, any element or substance which can be introduced to enhance the strength of the bond, naturally increases the wearing qualities of the road.

It may be well to state definitely at the beginning that Glutrin will not make a bad road good. In other words, it must have the benefit of proper construction in all details of drainage, selection of materials, and filling of voids, to produce best results. Given this foundation it may be said briefly, Glutrin will produce a thoroughly dependable road, with a firm hard surface, which has at the same time, sufficient resilience and elasticity to withstand the stresses due to temperature changes.

Being applied in a watery solution, its action on the aggregate produces a deep bond. As long as the road is damp and there is any motion of the aggregate, this production of the bond is renewed. With the drying of the road, this action ceases, the bond hardens and becomes strong. A rain or a heavy dew dilutes the unused Glutrin in the road and the formation of the bond goes on again. It will be appreciated from this that the action of glutrin is intermittently continuous, the amount of the bond increasing with each step until the Glutrin is entirely consumed. This explains the fact that glutrin-bound roads become harder as they become older.

When gravel or sand clay roads are to be treated with Glutrin, they should be scraped or harrowed. All loose sand should be removed and all the depressions filled with good gravel before any glutrin is applied. Unless this is properly done it is impossible to obtain good results. The glutrin is mixed with water in order to secure proper penetration and the mixes used vary from half Glutrin and half water to 1 part glutrin and 4 parts water. The glutrin then penetrates into the road and forms a very hard bond. The penetration will continue for some time after the application has been completed as it has a peculiar creeping quality much like that of ink on blotting paper, thus resulting in an increasing depth of the hardened surface of the road.

As you all know, it is necessary for gravel and sand-clay roads to absorb a certain amount of moisture, for, if they entirely dry out, the material will eventually break up. Glutrin retains its cementing qualities for a long time, but however, it will absorb enough moisture to permit the road to be dragged after rain and, when the loose material so dragged is packed down, the Glutrin will recement

this to the original road material. This is a very important feature on gravel roads, as they are bound to depress, rut, and loose from time to time.

There is a great advantage in making a glutrin-treated road practically dustless. A light rain or even a heavy fog will revive the life of the glutrin and keep the road dustless for a long period of time.

Glutrin has been used by the State of New York on gravel roads for the past twelve years and in Orange County all the gravel roads have been maintained with Glutrin for this period.

Glutrin has been used by the State of New Jersey on gravel roads in increasing quantities for many years. It was found that the roads so treated remained in excellent condition during all the months of the year, while the untreated roads, both in early and late winter, were seriously affected by alternate freezing and thawing and became so lumpy and full of ruts as to be practically impassable. During the season of 1921 all gravel roads in the state system were treated with Glutrin. The roads were scraped and dragged and put into good condition, by the State.

Immediately after the dragging had been completed the company supplying the material applied the Glutrin with their large pressure distributors especially constructed and equipped for laying this material.

The manufacturers of Glutrin own and operate their own tank car lines and were, therefore, able to keep plenty of material at the various railroad stations so no delay was experienced in the treatment of the roads.

In the treatment of gravel roads it has been found that in most cases the quantity of Glutrin required is not less than 6-10 gallon to the square yard and that the mixture should be one part Glutrin to two or three parts water. These figures, however, necessarily vary with the quality and density of the road material.

### Discussion on Mr. Young's Paper

(As Mr. Young was not able to be present, Mr. Hurt took his subject.)

MR. SEABROOK: Any questions?

QUESTION: I would like to ask the gentleman if he could tell me how far the material penetrates after the first application, that is penetrates the road.

MR. HURT: The penetration is as stated in the paper. It depends a great deal upon the density of the road and dilution used for the application. It will penetrate anywhere from 6 to 10 inches.

QUESTION: Regarding the harrowing of a road, would you recommend harrowing a road this year for next year's application?

MR. HURT: I would recommend that you put the road in shape every time before you make the application of glutrin in order to get the best results. The method of harrowing depends on the condition the road. If in a rutted condition, the thing to do is to get the ruts and holes out.

QUESTION: Is it any advantage in harrowing the road and then rolling it before the application of glutrin?

MR. HURT: You can do this, but it is not necessary as the traffic will iron it out.

QUESTION: I thought perhaps it might prevent ruts from trucks.

MR. ROBBINS: I would like to ask Mr. Hurt a question or two. He has already answered one of my questions as to the depth of penetration. I would like to know what covers the depth of penetration.

MR. HURT: The compactness of the road and the dilution of the treatment. The more the glutrin is diluted,

the further the penetration. The more compact the road, the less the penetration.

MR. ROBBINS: When you consider the proper percentage of dilution of the solution?

MR. HURT: As stated in the paper, it varies from 1 to 4 parts water to one part glutrin.

MR. ROBBINS: Covered by the density of the road?

MR. HURT: Yes.

MR. ROBBINS: There is a certain amount of clay in some roads. What is the limiting amount of clay binder?

MR. HURT: 15%.

MR. ROBBINS: What is the minimum?

MR. HURT: You get the highest tensile strength with 10%. As low as 2% will increase the material from 12 pounds to 24 pounds tensile strength, with 15% it increases to 48 pounds. One part Glutrin and 24 parts sand-clay, gives a tensile strength of 240 pounds. Practically the strongest material I ever tested.

MR. ROBBINS: What do you consider the minimum quantity for a square yard?

MR. HURT: 6 gallons.

MR. ROBBINS: For 15% clay content?

MR. HURT: Yes.

MR. ROBBINS: What do you consider the maximum quantity that should be put into a road. Pardon me, you have answered that, it depends upon the density.

MR. HURT: Yes.

MR. SEABROOK was called out at this point. Col. Whittemore took his place.)

COL. WHITTEMORE: I have heard a great deal in the papers about the use of Glutrin and the use of the Lignin Binder which it is claimed is as good as the other, only one costs more than the other. I would like you, if you will, just to please explain briefly what is the essential difference between the material treated called Glutrin and other material which has not been so treated which is known as Lignin Binder.

MR. HURT: I will only go as far as to say what Glutrin is. We take Spruce wood, cut it in chips and put it under pressure with a solution of Bisulphite of lime and mag-

nesia. This process dissolves the cellulose of wood pulp, and the solution is then treated with sulphuric acid to bind the wood together, the wood is then separated. From a ton of wood pulp we get 100 pounds of paper pulp, 100 pounds of wood pulp, and 100 pounds of binding solution, which is used to bind the wood together. This solution is drained off from the pulp as it comes from the digester. It is then treated to remove acids and is concentrated until there is about one fourth of the original volume left. That is the binder which we know as Glutrin. As for the other material on the market, we do not manufacture them, and I cannot tell you how they are made.

COL. WHITTEMORE: They all come from this one product of the paper mills.

MR. HURT: There are different methods in the manufacture of paper and I am not familiar with the materials you refer to, to such an extent that I could say how they are prepared or made.

MR. FERRY: I think the gentleman explained this very well. You were comparing to Lignin Binders compared with Glutrin. It just occurred to me that what you were trying to arrive at was, is Lignin Binder a trade name covering all of them, and was Glutrin a special process of manufacturing by one company? Lignin Binder is the general term for all binders coming from paper mills. We call them sulphide liquors which is the general term of those products coming from sulphuric acid, which makes pulp and comes out of the pulp and is known as lignin binder. It is made at the paper mills where they use sulphuric acid. It is this residue or Lignin Binder when made into a binder after 90% of the water is driven off that becomes the Lignin Binder. It was originally called sulphide liquor. Different companies manufacture it under different trade names. I believe that what you were trying to arrive at, is: Are there different kinds of lignin binders? They are, I presume, sold under different names, but they are all arrived at in that one way and all are used for the same purpose.

MR. HURT: There is no sulphuric acid used in the process of manufacture. Sulphurous acid is used, which is much less strong.

COL. WHITTEMORE: We will now proceed to the next subject.



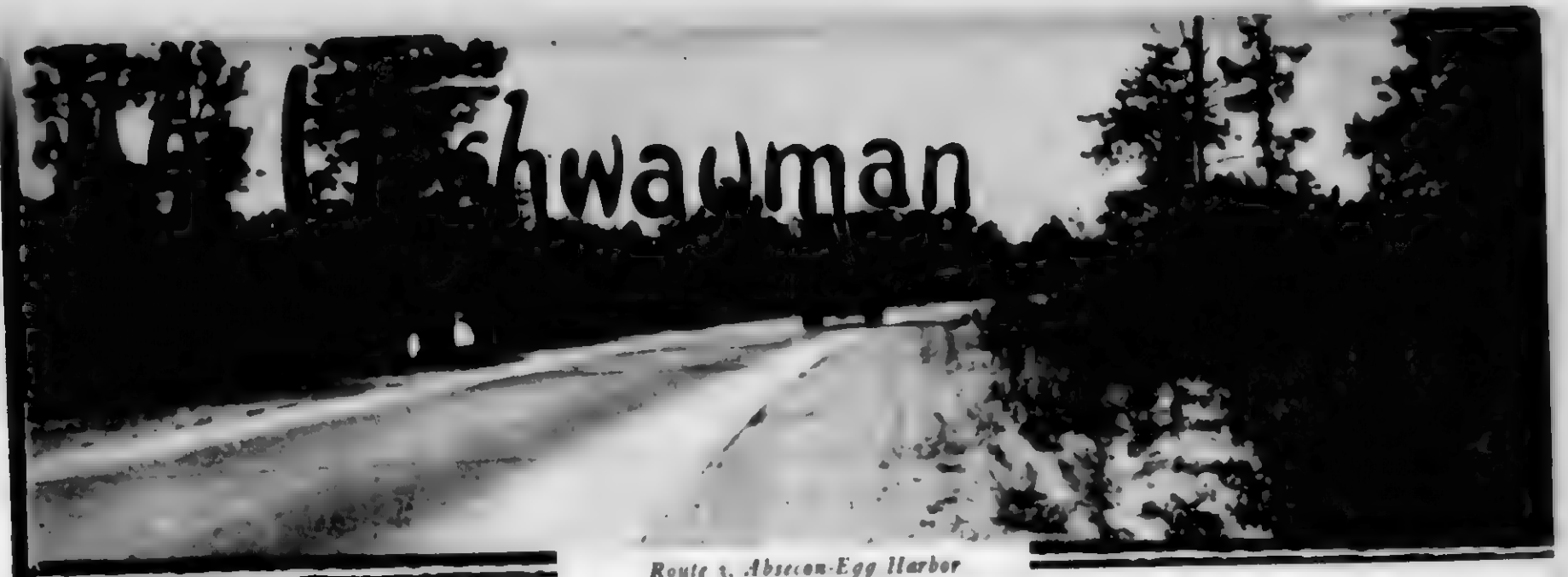
### For You— "The Highwayman"

Do you use roads? Do you want to know where they are being built, and what detours to take, each month.

Then send, TODAY, to

**The Highwayman**  
New Jersey State Highway Department  
Trenton, N. J.

Just ask to be put on the Highwayman's list. A postal will do.



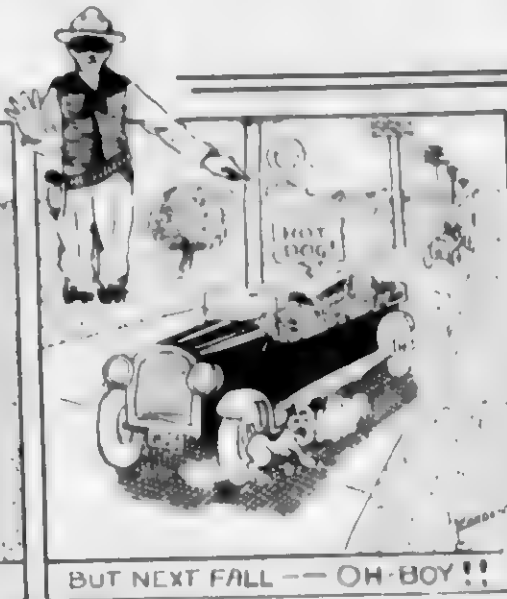
Route 3, Absecon-Egg Harbor

**The Highwayman Is Out  
For More and Better Roads  
in New Jersey**

June, 1922  
Vol. I  
No. 11



IT MAY MAKE YOU CUSS NOW.



BUT NEXT FALL — OH-BOY!!

When you run into a "detour" sign you may feel like cussing—but think of the years of better travel you are going to have as a result of it!

### "Detour!"

Think of What's Back of It

A good road.

A beautiful day.

You're in the dickens of a hurry—and then, all of a sudden, the road you're following is blocked off short and you are requested to "follow the arrow."

No wonder the words you use are such that we cannot, editorially, do them justice! They have to be left to the imagination. But any one who has ever "been there" can do some pretty accurate "imagining" on this point. Small wonder that, under such conditions, our choler rises and our collar wilts.

But after all, brother, there's nothing to get all hot up about. They are *your* roads; and you want 'em better; and there's no way to get 'em better except to do without using them while they're being fixed.

Moreover, it isn't only the particular piece of road that's blocked off which is being fixed. It's one more link in a nation-wide system of highways—a modern road of magic that will take you, with speed and in safety, to Where-You-Will. The hard-surfaced highway and the modern motors are the Twentieth Century "forty-league boots"—they will take you where you want to go as fast as the fabled foot gear, the story of which thrilled us all when we were kids. And they are *real*.

Furthermore, back of that barricaded road, which excites your ire and stirs your wrath,

there is something more. There is the organization known as your State Highway Department. In the old days, when roads were but strips of dirt set aside to travel on, it was merely a "department"—and a very minor one of the State's activities. Now it is one of the most highly organized and efficient bodies in the whole realm of public work. It carries on continuously research and experimental work, to determine how every dollar of *your* money can give you the maximum road value. It has its own expert chemists, laboratories, engineers, to make sure that the roads you get are built as carefully, and of as good materials, as you are paying to have them built.

Not only all this, but it has a "spirit"; an *ideal*; and that ideal is better roads, and better road service, than the world has ever known before.

So next time you strike a "detour" sign, and get red in the face, and bite your cigar in two, and split your collar-band—just stop and think of these things. And if you're not so darned much in a hurry as you think you are (which most of us usually are *not*!) just get out, and walk up the "closed" road, and watch 'em for a few minutes *building* a section of our national highway system—the greatest thing which this age is going to leave to the generations that are coming.

It will help you cool off!

*The Highwayman*



# The Highwayman of New Jersey

## The Highwayman

Published Monthly By The  
State Highway Department, at Trenton, N. J.

The HIGHWAYMAN will be sent free upon application  
to any citizen of New Jersey who is interested in  
"More and Better Roads For New Jersey!"

### THE HIGHWAYMAN

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C. F. BIDWELL, EDWARD E. REED  
CHAS. FISHBERG

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Executive Secretary - - - - - EDWARD W. O'BRIEN

## Say, Men—We Want You In On This!

The men of this Department are doing some paying that is not confined to the Highways, because every time we ask them for an article, they usually agree that they had it in mind to write on such and such a subject and have perfectly good intentions of doing so.

From the results we actually secured by our requests for information we are convinced that these fellows are furnishing a good deal of paying (in the form of good intentions) for a still hotter climate than New Jersey.

Right here we want to say that although we have heard a lot about good work, good men, good material plants, etc., and the fact that articles are going to be sent in on these subjects—but they never reach us.

We all get tired about hearing of the fellows in the Administrative Office and would like to hear about and from the men actually on the work. Construction Inspectors, for instance, must be brim full of good stuff that the HIGHWAYMAN is anxious to print. Good stories and information are not confined to them, however, we would have to mention every employee in the State Highway Department to cover the possible sources of interesting information for this publication.

Don't be afraid to express your point of view. If after looking over your stuff, we feel that it is not policy to print, it will not be a reflection against the writer or the material sent in. If you can't think of a subject to write about, send us a postal card and we will suggest one to you. Very much less than one-half of one per cent. of the information we receive is rejected for any reason.



MARVEN HOWELL

Who has been Chief Auditor and Accountant  
of the State Highway Department since 1919

### He Checks Up

#### On How Your Money Spent

Mr. Howell is another "Trenton" member of the New Jersey State Highway Department.

He was born in this city in 1887 and received his education in the Trenton public schools, including the Trenton High School, from which he was graduated in 1905. After leaving High School he took the Pace and Pace course in higher accounting.

He first accepted a position with the Mechanics National Bank of Trenton, New Jersey, leaving the above institution after a year's service, to operate the Troy Laundry Company of this city. He disposed of his interests the following year and located in Milwaukee, Wisconsin. Here he remained for eleven years, the last five of which he was in charge of the Accounting Department of the O. C. Hansen Manufacturing Company of that city.

In 1917 Mr. Howell accepted a position with the New Jersey State Highway Department as Auditor and Accountant, and became Chief Auditor and Accountant in 1919.

### Personal Mention Column

Eddie O'Brien! Do you know Eddie? He is the man you have to pass in order to get into the Chief's Office. Not very tall, but full of pep and one of the hardest working men in the Department. He is one of the several men of the Department, who have a task that is not loaded down with glory, but nevertheless, a lot depends upon his accuracy, good judgment, tact, perseverance and hard work.

Some young men would feel that they were being imposed upon by the gruelling work that is often Eddie's lot, but we think that Eddie appreciates the opportunity for growth and advancement, that usually goes with this kind of a position.

In spite of the fact that Eddie's attention is continually divided between the Chief's buzzes, which means some rapid fire dictation, that "busy telephone" and the many visitors who seek admission to the Chief's Sanctum, Eddie turns up a cheerful countenance to all those who enter his ante-room and has the sincere respect and liking of the men and women of the Department.

### Large Increase in Population of Testing Engineers

J. Glenn Bragg recently passed cigars in celebration of the event of John Harper Bragg. Pop Bragg just breezed in the office, very much in need of a shave, and when we started to read this article to him, he allowed that J. Harper ain't going to be no Testing Engineer. Said he would rather see him follow some useful occupation like carrying the hod.



JOHN LEONARD VOGEL

Who becomes, on July 1, Bridge Engineer of the  
New Jersey State Highway Department

John Leonard Vogel, Member American Society of Civil Engineers, Jersey City, N. J. (elected Junior Nov. 5, 1907; Associate Member May 6, 1914). Age 38. Born Jersey City, N. J. Completed five year course in science, Cooper Institute, New York City (nights) August, 1901, to Mar., 1902, with American Bridge Company, Brooklyn Plant, part of time as Draftsman. March, 1902, to February, 1906, with the H. W. Post, Cons. Engrs., New York City, as Draftsman, Estimator and Designer of structural steel work for buildings and bridges; February, 1906, to January, 1914, with the Central R. R. Co. of New Jersey, as Draftsman and Designer, until February, 1910, detailing and designing steel buildings, bridges and other miscellaneous structures; then Asst. Bridge Engineer in charge of preliminary and final designs, specifications and estimates for bridges, buildings, grade-crossings elimination, and other structures; work comprised design of steelwork for four-span ferry terminal at Jersey City, steel viaduct over Navesink River at Red Bank (about 1800 feet long, double track), elevation of Newark and New York Branch (2 miles long) including two 256 ft. span double-track draw-bridges; design of plate girder and truss highway and railway bridges (span varying to 200 ft.) etc.; January, 1914, to October, 1916, Prin. Asst. Engineer, Board of Public Utility Commissioners, State of New Jersey, Div. of Bridges and Grade Crossings, inspection of railroad and trolley bridges in State, approval of bridge designs, investigations of bridges and grade-crossing elimination designs and estimates, all types of bridges, drawspans, lift spans, arches, reinforced concrete, etc.; October, 1916, to June, 1918, with Henry Steers, Inc., Contr. Engrs., as Designing Engr. of docks and piers (timber, reinforced concrete and filled in), pier and sheds and other miscellaneous structures, also estimating and general field work; June, 1918, to date, Designing Bridge Engineer, Board of Public Utility Commissioners, State of New Jersey, design and construction of all bridges (steel and reinforced concrete) for State Highway Commission of New Jersey.

### Texas After Highway Grade Crossings

From the Texas Highway Bulletin we quote the following:

"Grade-crossings must be entirely eliminated from our highways. Out of 12,000 persons killed on the highways last year, 7,000 were struck down on grade-crossings. Investigation has shown that one motorist out of every three is careless at grade-crossings, approaching the tracks at a reckless speed without taking due notice of approaching trains. On the Southern Pacific Railroad alone 1909 cars or trucks were wrecked during the last three years.

A total of \$4,500,000 was paid out in death claims by the American insurance companies for the 12,000 persons killed last year. In addition to the fatalities there were 1,500,000 non-fatal injuries."

### NEW JERSEY STATE HIGHWAY DEPARTMENT

March 1st, 1922

#### Executive

HON. EDWARD I. EDWARDS, Governor

The State Highway Commission  
and

THOMAS J. WASSER, State Highway Engineer

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CHAS. FISHBERG - - - Assistant Chief Clerk  
MISS GRACE WILLIAMSON - - - Chief File Clerk  
R. W. WILDBLOOD - - - Purchase Clerk

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G. R. MOORE, Asst. Construction Engineer

R. A. MEERER - - - Right of Way Engineer  
C. A. MEAD - - - Bridge Engineer  
THOMAS GEORGE - - - Acting Supt. of State Labor  
C. A. BURN - - - Northern Division Engineer  
H. D. ROBBINS - - - Central Division Engineer  
J. A. WILLIAMS - - - Southern Division Engineer

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A. W. MUIR - - - Superintendent of Maintenance  
JACOB HAGIN - - - Superintendent of Plant and Equipment  
N. C. APPELGATE - - - Supervisor of Equipment  
A. D. BULLOCK - - - Projects Engineer  
H. C. SHINN - - - Engineer of Special Assignments

#### TESTING LABORATORY

R. B. GAGE, Chemical Engineer

J. G. BRAGG - - - Senior Testing Engineer  
F. H. BAUMANN - - - Senior Testing Chemist

"The aim of the New Jersey State Highway Commission is to promote the enthusiasm of every officer and employee in behalf of a high standard of public service, for it is the men of the State Highway Department who, by ability, loyalty, initiative, and faithful work, make the service what it is."  
—GEO. L. BURTON, Chairman.

### Famous Sayings

MAT. CUTLEY: The idea is this! (N. D. Supervisor).  
TOM. ARRASTIBIA: Get busy! Get busy! (Foreman).  
WOODRUFF: We won't discuss the matter any further.  
MISS BARNETT: While I don't smoke, my favorite tobacco is "NAVY."

### Watch the Curves

The fatalities from auto accidents increase with each month. With the tourist season just fairly starting, it behooves every autoist to do his utmost to see that his car does not maim or kill a fellowman as any result of his carelessness or indifference.

Many accidents occur at railroad crossings, and the men or women who try to beat the train are about in a class with the fellow who didn't know it was loaded—they are hopeless. But there is another source of accidents that can be watched carefully with the result of reducing the accident column very much—that is the curves. Take every curve at such speed that the car can be instantly stopped. You cannot see what is around the corner—neither can the other fellow. Do your part, be alert, watchful and careful, and then no accident will be charged to you.

# The Highwayman of New Jersey

5



Mr. McClave, of the firm of McClave & McClave, is County Engineer of Bergen County; Vice-President New Jersey Association of

ROSCOE P. MCCLAVE

## Bergen County's Hustling Engineer

If you want to know the life history of Mr. Roscoe P. McClave, just take it from his own words, as follows: Born in New York 1881. Moved to New Jersey 1883. They tell me that I did not do very much to help with the moving. Nevertheless, we located in what is known as Cliffside Park.

Attended public and private schools both in New Jersey and New York. The schools which I attended were Fairview, Edgewater, Cliffside, Thirteenth Street in New York, Stevens Preparatory, Trinity, and took an engineering course in Princeton University. In the last named place also took some courses that were not in the curriculum.

Engineering work—El Paso, Northwestern and Western Railroad in New Mexico; New York Western and Boston Railroad from New York to White Plains; Pennsylvania Railroad, Pennsylvania Terminal; New York State Highway Department; McClave & McClave, Engineers, Cliffside Park, N. J.; Bergen County, New Jersey.

## Married Men—Beware!

We will have to watch our step

Telephone rang, Art Bullock answered it and said to Cliff Whiteley, "Your wife wants to talk to you." Cliff picked up the telephone and very sweetly said, "Hello, Dear". Right after this the color of Cliff's face quickly assumed the hue of a red, red rose and profuse apologies were undertaken on his part. The conversation finally ended by Cliff saying, "All right, Miss Laughry, I hope you will pardon the mistake."

This only goes to show how we have to be careful in using the telephone because we cannot see who is on the other end.

Harry Shinn had a somewhat similar experience. Our Telephone Operator sits in the window in the L opposite Shinn's office, but a wall prevents a clear vision between the telephone switchboard and Shinn's desk. Peggy inquired across the way through the window if Mr. Shinn was in. Upon being assured that he was by Mr. Bullock, Shinn's telephone rang and Shinn, thinking he was talking to Peggy, said in a very over-sweet tone of voice "Hello Peggy". Harry's wife was connected from Lakewood on the wire. You know Harry had some explaining to do.

TAKE OUR WORD, BOYS, YOU CAN'T BE TOO CAREFUL.

Good engineering is the only safe insurance against waste in highway construction.

County Engineers. He is also a member of the Executive, Publicity, Specifications, and Standard Form Committees of the County Engineers Association.

## 180,000 Miles of Good Roads!

If you drive a car, you'll be interested in this: When the government finishes up the roads it is helping build, the country will have a network of 180,000 miles of surfaced main highways, connecting Atlantic and Pacific coasts and our northern and southern borders.

To travel over that much road you'd have to drive your car 30 miles an hour, 24 hours a day, for 250 days.

Road projects under way in 1921 amounted to nearly 65,000 miles—about 11 times across the continent and back. During the year Uncle Sam and the States built 11,930 miles of federal-aid highways.

We are developing a great civilization here in America, for road building is in all centuries the measure of progress.

The speed with which, compared with former civilizations, we have flung a network of good roads through our wilderness and mountains and across our plains, is little short of amazing.

The first state road-building program was started only 101 years ago in Kentucky, when Abraham Lincoln was a boy of 12.—*NEA Service.*

## From Chariot to Flivver

Traffic-on-wheels originated in China and Egypt, where carts were first invented.

Those first carts moved on wheels and axles carved out of one solid piece of stone. It took centuries for man to conceive of the axle being separate from the wheels.

The old Romans, master road builders, had 29 paved highways out of Rome. Over pavements of brick and mineral cement they drove their lumbering chariots with iron-rimmed wheels.

Joy-riders of those days lounged in reed-work baskets mounted on solid wheels about a foot thick.

Think of that when riding in a flivver seems bumpy.

## Get Back of the Good Roads Movement!

Man's battle for good roads has been going on for thousands of years, ever since prehistoric man cleared a path through the jungles.

It may be that the roads of the future will be in the air, with flying machines carrying passengers and freight. That, however, is bound to be a long way off. It is good to dream about. But, meantime, let's keep our feet on the ground and get behind the good-roads movement stronger than ever. Prosperity and recreation come slowly over bad roads.

The advertising makes it possible to equip our highways with these city and limb savers. We hope other



One of the new "Warning Signals" that are making travel safe

advertisers will follow the excellent taste in advertising "copy" which McManus Bros. have displayed.

## Municipalities Through which the Several State Highway Routes Pass

Route No. 1. Trenton to Jersey City—From Trenton through Mercerville, Hamilton Square, Robbinsville, Windsor, Hightstown, Cranbury, Dayton, Deans, Black Horse, Georges Road, Red Lion, Voorhees, New Brunswick, Highland Park, Metuchen, Menlo Park, Iselin, Colonia, Rahway, Wheatshaf, Elizabeth, Newark, Kearney, to Jersey City.

Route No. 2. Camden to Trenton—From Camden through Bethel, Morrisville, North Pennsville, Cinnaminson, New Albany, Fairview, Bridgeboro, Cooperstown, Burlington, Stevens, Dobbins, Roebbing, Kinkora, Fieldsboro, Bordentown, White Horse to Trenton.

Route No. 3. Camden to Absecon—From Camden through West Collingswood, Audubon, Haddon Heights, Barrington, Kirkwood, Laurel Springs, Berlin, Aco, Chesilhurst, Waterford, Ancora, Elm, Hammonton, Dacosta, Elwood, Egg Harbor City, Germania, Pomona, Dougherty, to Absecon.

Route No. 4. Absecon to Rahway—From Absecon through Conoversville, Oceanville, Centerville, Smithville, Johnstown, New Gretna, Bass River, Tuckerton, Parkertown, West Creek, Staffordville, Mayetta, Cedar Run, Manahawkin, Barnegat, Waretown, Forked River, Cedar Creek, Bayville, Toms River, Pleasant Plains, Seven Stars, Lakewood, Burrsville, Point Pleasant, Brielle, Manasquan, Sea Girt, Villa Park, Spring Lake, Como, Belmar, Avon-by-the-Sea, Bradley Beach, Ocean Grove, Asbury Park, Allenhurst, Deal Beach, Elberon, Long Branch, West Long Branch, Eatontown, Shrewsbury, Red Bank, Middletown, Betsy Ross Farm, Keyport, Morgan, South Amboy, Perth Amboy, Woodbridge, Demorest, to Rahway.

Route No. 5. Delaware to Irvington—From Delaware through Ramseyburg, Manunka Chunk, Bridgeville, Buttsville, Pequest Furnace, Townsbury, Danville, Vienna, Hackettstown, Budd Lake, Netcong, Ledgewood, Kenil, Mine Hill, Dover, Rockaway, Denville, Tabor, Morris Plains, Morristown, Convent Station, Madison, Chatham, Summit, Springfield, Hilton to Irvington.

Route No. 6. Salem to Camden—Bridgeton to Mullica Hill—Salem to Bridgeton—From Salem through Welchtown, Woodstown, Mullica Hill, Jefferson, Mantua, Woodbury, Westville, Gloucester, to Camden.

From Bridgeton through Finley Station, Deerfield Street, Shirley, Pittsgrove, Pole Tavern, Whig Lane to Mullica Hill.

From Salem through Quinton, Pecks Corner, Shiloh to Bridgeton.

Route No. 7. Hightstown to Asbury Park—From Hightstown through Bergen Mills, Manalapan, Freehold, Jerseyville, Hamilton, Hamilton Mills, Ocean Grove Heights, to Asbury Park.

Route No. 8. Montclair to State Line at Unionville—From Montclair through Verona, Cedar Grove, Singac,

Mountain View, Wayne, Pequannock, Pompton Plains, Riverdale, Bloomingdale, Butler, Smith Mills, Charlottesburg, Newtownland, Stockholm, Beaver Lake, Franklin Furnace, Hardistonsville, Hamburg, Sussex to Unionville.

Route No. 9. Phillipsburg to Elizabeth—From Phillipsburg through Still Valley, Bloomsbury, West Portal, Perryville, Clinton, Annandale, Lebanon, Potterstown, Whitehouse, Merchantsville, North Branch, Raritan, Somerville, Bound Brook, East Bound Brook, Dunellen, Plainfield, Lanwood, Westfield, Garwood, Cranford, Roselle Park, Elmore, to Elizabeth.

Route No. 10. Paterson to Fort Lee Ferry—From Paterson through Dundee Lake, Rochelle Park, Hackensack, Little Valley, Ridgefield, Palisade Park, to Fort Lee Ferry at Edgewater.

Route No. 11. Newark to Paterson—From Newark through Belleville, Bloomfield, Nutley, Passaic, to Paterson.

Route No. 12. Phillipsburg to Paterson—From Phillipsburg through Coopersville, New Village, Broadway, Washington, Port Colden, Beattystown, Hackettstown, thence over Route No. 5 by way of Budd Lake, Netcong, Ledgewood, Kenil, Mine Hill, Dover and Rockaway to Denville, thence through Fox Hill, Parsippany, Pine Brook, Fairfield, Little Falls, Totowa, to Paterson.

Route No. 13. Trenton to New Brunswick—From Trenton through Lawrenceville, Cox's Corner, Princeton, Kingston, Little Rocky Hill, Ten Mile Run, Franklin Park, Voorhees, to New Brunswick.

Route No. 14. Cape May to Egg Harbor City—From Cape May through Bennett, Rio Grande, Whitesboro, Burleigh, Wildwood Junction, Mayville, Cape May Court House, Swainton, Clermont, Ocean View, Seaville, Greenfield, Cedar Springs, Petersburg, Middletown, Tuckahoe, Oakville, Estelleville, Mays Landing, to Egg Harbor City.

Route No. 15. Bridgeton to Rio Grande—From Bridgeton through Gouldtown, Millville, Menantico, Port Elizabeth, Bricksboro, Dorchester, Delmont, Eldora, East Creek, Dennisville, South Dennis, Goshen, Dias Creek, Pierces, Green Creek, Nummy Town to Rio Grande.

Route No. 16. Princeton to Morristown—From Princeton through Harlingen, Belle Mead, Pleasantview, South Somerville, Somerville, Pluckemin, Bedminster, Far Hills, Mine Brook, Bernardsville, Van Dorens' Mills, Glen Alpin, to Morristown.

Accepting half-baked opinions of political demagogues on highway matters is the poorest investment a taxpayer can make.



## Contract News

Prepared to June 15, 1922

Feb. 6—Route 6, Section 5, Shirley-Oldman's Creek, Reinforced Concrete Paving job, 6.812 miles, 20 feet wide with gravel shoulders, was awarded to the Benjamin Foster Company, Philadelphia, Pennsylvania, on their low bid of \$254,021.53.

Feb. 15—Route 6, Section 6—Old Man's Creek-Mullica Hill, Reinforced Concrete Paving job, 5.028 miles, 20-30 feet wide with gravel shoulders, was awarded to the firm of M. Staub, Swedesboro, New Jersey, on his low bid of \$203,660.48.

Feb. 14—Route 2, Section 3, South Broad St., Storm Drain job was awarded to A. G. Thompson, of Trenton, New Jersey, on his low bid of \$17,665.06.

March 6—Route 6, Section 10, Quinton to Marlboro, Grading and Graveling job, 5.994 miles, 20 feet wide, with earth shoulders, was awarded to the Masterson Construction Corporation, New York City, on their low bid of \$79,793.17.

March 6—Route 6, Section 11, Salem to Quinton, Reinforced Concrete paving job, 2.648 miles, 20 feet wide with gravel shoulders was awarded to Joseph E. Burke, of Plainfield, New Jersey, on his low bid of \$111,833.79.

Feb. 27—Route 10, Section 1-B, Arcadian Way to Anderson Ave. in Fort Lee, Reinforced concrete paving job, 0.48 miles, 20 and 30 feet wide with earth shoulders, was awarded to the firm of John J. McGarry, Edgewater, New Jersey, on his low bid of \$104,362.61.

Feb. 21—Route 14, Section 5, Cape May Court House to Swanton, Reinforced Concrete Paving job, 2.987 miles, 20 feet wide with gravel shoulders, was awarded to the firm of Sutton and Corson, Ocean City, New Jersey, on their low bid of \$118,776.16.

March 8—Route 4, Section 9, Smithville-Mullica River, Warrenite Bitulithic job, on concrete base, 3.748 miles, thirty feet wide, with gravel shoulders was awarded to C. H. Earle of Hackensack, New Jersey, on his low bid of \$374,533.77.

March 8—Route 4, Section 6, Eatontown-West Long Branch, Sheet Asphalt job on Concrete Base, 2.69 miles, 20 feet wide with earth shoulders was awarded to the Utility Construction Company of New Brunswick, New Jersey, on their low bid of \$149,679.74.

April 14—Route 5, Section 5, Madison Ave., Madison Township and Borough of Madison, Warrenite Bitulithic on Concrete base, 2.032 miles, 20 feet wide with earth shoulders, was awarded to the Northern Construction Company, of Newark, New Jersey, on their low bid of \$117,844.37.

April 13—Route 15, Sections 2 and 3, Bridgeton-Millville, Warrenite Bitulithic on Concrete base, 8 miles, 20 feet wide with gravel shoulders was awarded to the Tri-State Construction Company of Bridgeton, New Jersey, on their low bid of \$455,500.12.

April 14—Route 4, Section 14, Lakewood-Lakewood, 3.875 miles, Reinforced Concrete Paving job, 20 feet wide with gravel shoulders was awarded to C. H. Earle of Hackensack, New Jersey, on his low bid of \$144,705.68.

April 28—Route 4, Section 13, Richmond Ave., Point Pleasant Beach, Reinforced Concrete paving job, 0.848 miles, 20 feet wide with earth shoulders was awarded to C. H. Earle of Hackensack, New Jersey, on his low bid of \$35,471.76.

May 16—Route 4, Section 15, Lakewood (County section) 2.556 miles Reinforced Concrete Paving job, twenty-eight and thirty feet wide, was awarded to the Public Service Production Company of Newark, on their low bid of \$75,748.82.

May 16—Route 4, Section 15, Lakewood (Township Section) 2.556 miles, Reinforced concrete paving job, 36 and 50 feet wide was awarded to C. H. Earle of Hackensack, New Jersey, on his low bid of \$105,741.10.

May 23—Route 6, Section 12, East Commerce Street, Bridgeton, 1.314 miles long, Sheet Asphalt paving job on Concrete Base, 20 and 32 feet wide, was awarded to E. R. Mixner Co., on their low bid of \$80,422.01.

May 26—Route 9, Section 8, North Branch-Somerville, 3.837 miles, Reinforced Concrete paving job, 20 feet wide with earth shoulder was awarded to Ralph Sangiovanni, on his low bid of \$159,077.59.

May 26—Route 16, Section 3, Bedminster-Pluckamin, 2.415 miles Reinforced Concrete paving job, 20 feet wide with earth shoulders was awarded to Ralph Sangiovanni, on his low bid of \$135,648.39.

May 26—Route 4, Section 16, Maine St., Toms River, 1.096 miles long, Reinforced Concrete paving job, 20, 30, 36, 38 and 56 feet wide with gravel shoulders was awarded to the Public Service Production Company of Newark, on their low bid of \$62,864.59.

June 2—Route 5, Section 9, Barkers Corner-Hacketts-town, 2.99 miles Reinforced Concrete paving job, 20 and 48 feet wide with earth shoulders was awarded to Frank J. Groman, of Bethlehem, Pennsylvania, on his low bid of \$230,274.37.

June 6—Route 2, Section 3-A, Whitehorse-Crosswicks Creek, 0.389 miles, Reinforced Concrete paving job, 30 and 40 feet wide was awarded to Daniel Klockner, of Trenton, New Jersey, on his low bid of \$37,472.82.

Jan. 10—Route 6, Section 8, Pearl St., Bridgeton, Reinforced Concrete paving job, 0.455 miles, 20 and 30 feet wide with gravel shoulders was awarded to the Tri-State Construction Company, Bridgeton, New Jersey, on their low bid of \$76,302.36.

April 5—Route 4, Section 10, Shadow Lawn-Roseld Avenue, Sheet Asphalt Paving job on Concrete Base, 2.41 miles, 20 and 36 feet wide with earth shoulders, was awarded to Newark Paving Company, of Newark, New Jersey, on their low bid of \$104,969.51.

April 4—Route 2, Section 3, South Broad Street, Sheet Asphalt job, on Concrete Base, 0.648 miles, 48.5 feet wide, was awarded to J. J. Barrett, Trenton, New Jersey, on his low bid of \$69,433.77.

March 1—Route 11, Section 1, Main Street, Passaic, Sheet Asphalt job, on Concrete Base, 0.257 miles, 22 feet, 2 inches wide, was awarded to Union Building Construction Company, Passaic, New Jersey, on their low bid of \$15,160.15.

April 5—Route 4, Section 12, Sea Girt Avenue, Reinforced Concrete Paving job, 0.162 miles, 20 feet wide with earth shoulders was awarded to T. H. Riddle, New Brunswick, New Jersey, on his low bid of \$8,569.23.

April 4—Route 9, Section 6, Somerville-Bound Brook, Reinforced Concrete Paving job, 2.491 miles, 20 feet wide, earth shoulders was awarded to Salmon Brothers, Netcong, New Jersey, on their low bid of \$131,710.10.

March 31—Route 4, Section 5-A, Storm Drain in Red Bank, was awarded to Chas. J. Romano, Montclair, New Jersey, on his low bid of \$15,314.85.

April 10—Route 6, Section 9, Salem-Collier's Run, Reinforced Concrete Paving job, 4.752 miles, 20 feet wide with gravel shoulders was awarded to Sampson & Reuter, Elizabeth, New Jersey, on their low bid of \$196,975.08.

April 18—Route 9, Section 5, Union Avenue, Bound Brook, Sheet Asphalt on Concrete Base, 1.501 miles, 20 feet wide with earth shoulders was awarded to the Utility Construction Company of New Brunswick, New Jersey, on their low bid of \$93,090.31.

April 10—Route 3, Section 8, Camden-Clements Bridge Road, Reinforced Concrete Paving job, 3.82 miles, 36 and 40 feet with earth shoulders was awarded to W. Penn Corson, Camden, N. J., on his low bid of \$269,644.85.

April 10, Route 3, Section 9, Clements Bridge Road-Kirkwood, Reinforced Concrete Paving job, 3.756 miles, 29 feet wide with earth shoulders was awarded to John M. Kelley Construction Co., Camden, N. J., on their low bid of \$200,592.95.

April 10—Route 3, Section 10, Kirkwood-Berlin, Reinforced Concrete Paving job, 5.576 miles, 29 feet wide with earth shoulders was awarded to John M. Kelley Construction Co., Camden, N. J., on their low bid of \$297,993.89.

## Road Inspection—Its Mighty Important Work

The following article appearing on the editorial page of *Successful Methods* entitled "School Boy Inspectors" emphasizes the advisability of the policy inaugurated in this Department of securing good men as far as possible for the important position of Inspector on road work.

The rapid expansion of highway work and improvements in requirements of highway construction have made it so complicated, that this Highway Department through educational work is training men to better fill the position of Inspector. This work, together with the requirements of the specifications insures the contractors against acts of inspectors which are so heartily condemned in the article referred to. The Inspector has not the authority to initiate drastic action in connection with contracts made by the Department, as the contract and specifications provides that important decisions affecting the work must come from the Executive Office.

### SCHOOL BOY INSPECTORS

Early next month the annual crop of school boy inspectors will appear. All over the country boys fresh from college who know practically nothing about construction work will be placed as dictators on jobs of every kind. Practically all these boys are honest. They have the best

intentions in the world. They are all short on just one vital qualification—experience.

This annual fiasco has gone on since the memory of man runneth not to the contrary. Most contractors believe there is no hope of avoiding the handicap such inexperienced inspectors put on their work. They look on the coming of these school boy engineering authorities as they do on late frosts, floods and droughts. Acts of God—inevitable—anything you want to call them. Only use plenty of language.

Most engineers appreciate the situation. Generally their hands are tied by a lack of sufficient funds to hire competent, experienced inspectors. There are, however, many notable exceptions. Too often engineers take the attitude that the inspector must be a parrot on the specifications. He must say and do what he is told. He can be trusted to exercise very little judgment; and, in too many cases, that unfortunately is true.

Sooner or later engineering societies will get down to earth in more of their deliberations. They have come a long way in the last 20 years from their pinnacle of "pure science" of the old days. One of the bed rock subjects they will consider before long is the elimination of incompetent and inexperienced inspectors. May Providence speed that day.

## Sharp Turns

By JAMES W. BROOKS

Placing a man in office for a definite task and then wasting his time with complaints is poor business.

As a cost-reducer nothing beats a full day's work.

It might not be amiss to suggest that taxpayers are beginning to wonder if overhead expense in road promotion isn't getting a bit too high.

Diverting motor vehicle receipts into channels other than road construction and maintenance is an unsafe financial detour for any state.

Redeeming a highway bond is easier than pulling through mud. In the first case, payment comes only once; in the second every time it rains.

A rich man's pocket book is sometimes the biggest rock in the way of road improvement.

The politician who shouts loudest in behalf of the taxpayer is really shouting to save his own political hide.

The road ahead today for this Nation leads back to the farm.

No political formula can take the place of an engineer's blue-print, and build roads that will amount to anything. Half truths are like cheap roads. Both fall short of satisfactory results.

In the meantime, the transmission of highway power from horse-collar to gasoline goes steadily on.

It takes a long vision indeed to keep up with the lengthening demands for modern highway service.

—Highway News Digest.



Does it make a difference in the town? Well, we guess yes! (Left) "Before" June 29, 1921; (Right) "After", May 11, 1922: Route 4; Section 5, Red Bank-Eatontown

# The Highwayman of New Jersey

If you've ever had occasion to call the Highway Department, you know sweet-voiced "Peggy" (She was christened Anna F. Barnett, but nobody bothers about that!) Peggy is a good little Highway-



"PEGGY" AT THE PEGS

man, but she never holds you up for a number. Believe us, it's going some to be a switchboard operator, and one of the most popular persons in the Department at the same time.

## Eliminating the Filling Station Nuisance Salem is the First City to Co-operate with the Highway Department

Included in the general program of "service to motor car owners" which the Highway Department has inaugurated, is the aim to keep the roads clear.

For this reason, as mentioned in a previous issue of the HIGHWAYMAN, the Department has adopted a general policy of keeping all filling stations well back from the highways, with "drive-in entrances," so as to prevent the congestion of traffic which so often takes place where such stations are too near the highway.

It gives us great pleasure to reproduce the following correspondence, which shows how the City of Salem, New Jersey, has co-operated with the Department in attaining this very well worth while improvement:

### CITY RECORDER'S OFFICE Salem, N. J.

William B. Dunn, City Recorder

Salem, New Jersey, April 25, 1922.

State Highway Commission,  
Trenton, New Jersey.

Attention:—Mr. Wasser.

Dear Sir:—At the meeting of Common Council last evening the following resolution was unanimously adopted: "Be it Resolved, That no gasoline or oil filling stations be erected on any State Highways within the City limits, after the adoption of this resolution unless same comply in every respect to the provisions and regulations of the State Highway Department."

Council thought you might be interested to know that the City will cooperate with you in every way in regulating the installation of these tanks.

Yours very truly,

W. B. DUNN, Recorder.

State of New Jersey  
State Highway  
Commission  
Trenton

April 27, 1922.

Mr. W. B. Dunn,  
City Recorder,  
City of Salem, N. J.

Dear Sir:—It was very gratifying indeed to receive from you your communication of April 25th, in which you quoted the resolution passed by your City in regard to the installation of gas tanks and filling stations within your City along the State Highways.

Your city is the first municipality to openly

support the State Highway Commission in its effort to eliminate congestion of traffic by requiring all gasoline filling stations to be so located as to require drive-in entrances, and if you have no objection, I will be only too glad to publish this letter from you in our monthly publication in order to give it the widest publicity, trusting that there are other municipalities which may be giving us their support but have not advised us of the fact. Your letter will be presented to the Commission at the next meeting.

Thanking you on behalf of the Commission for the co-operative spirit shown, I remain

Very truly yours,

T. J. WASSER, State Highway Engineer.

TJW/O'B.  
2066-4-26.

CITY RECORDER'S OFFICE  
Salem, N. J.

William B. Dunn, City Recorder

Salem, New Jersey, April 28, 1922.

Mr. Thomas J. Wasser,  
State Highway Engineer,  
Trenton, New Jersey.

Dear Sir:—Your letter of the twenty-seventh instant is at hand and we naturally are pleased that Salem City has taken the initiative in supporting the State Highway Commission in the matter of gasoline and oil stations.

You are at liberty to use the resolution adopted by Common Council, but I feel that it is rather brief for a newspaper article. You might add, if you like, that when the question of allowing a gasoline and oil station to be installed on East Broadway, now a part of the State Highway System, Route 6,

that the Council immediately notified the applicant that the body would not act otherwise than with the rules and regulations of the State Highway Commission, and the resolution was adopted. so Council's stand would be a matter of record. The applicant was referred to the Commission, with the statement that whatever the Commission said or ruled would be supported by Council.

The matter of gasoline and oil stations along the main thoroughfares of Salem City



Bridges of Beauty, as well as of strength and durability, are the aim of the Department.

Here's the chief, T. J. Wasser, "caught" as he was leaving the quarry of the Bath Portland Cement Company at Bath, Pennsylvania. We don't know whether that piece of cement rock, in his left hand, is a little present for



"T. J." IN ACTION

Testing Engineer Gage, or destined to be "shied" at somebody in the office. At any rate, the chief, judging by his smile, seems well pleased with the fact that he is "getting away with it."

has been a troublesome one. As we have no ordinance governing their installation, many have been placed under the sidewalks, without permission from the governing body. Some of these tanks have also been placed so near the street intersections that traffic is handicapped. Right in the heart of the City, or business section, some tanks are located, and you can imagine what a nuisance they are at times.

We will appreciate it if you will keep us informed of any rulings regarding tanks that your body may make in the future.

Yours very truly,

W. B. DUNN, Recorder.

STATE OF NEW JERSEY  
State Highway Commission  
Trenton

May 4, 1922.

Mr. W. B. Dunn,  
City Recorder,  
Salem, N. J.

My Dear Sir:—I am directed by the State Highway Commission to acknowledge your favors of April 25th and 28th, concerning the action of the Common Council of the City of Salem concerning the erection of gasoline filling stations within the city limits of Salem.

I am further directed by the Commission to express to you its appreciation of your co-operation in this matter which is of vital importance in facilitating traffic on State Highways.

Very truly yours,

A. LEE GROVER, Secretary.

G/R

## Better Bridges for New Jersey

Compare the bridges shown on this, and on the preceding pages, with the average small bridge you come across. Each is but a short span. A wooden bridge, with a rickety side-rail would have "answered the purpose"—temporarily.

The aim of the High-



Bridges like these, built by the State Labor Forces, the Department is justly proud of

way Department, however, is to have all bridges just as staunch and permanent as it is making the roads of the state. Bridges like these will last for generations—and with no costly repairs and replacements. They are not only better and safer, but in the end less expensive, than the "cheap" bridges they replace.

## Resolution Passed at the National Agricultural Conference at Washington, D. C.

Country highways are the farmer's first and principal transportation means of marketing his products. They are the arteries of the economic and social system of the country. On their condition rests the amount of the transportation charge that must be added to the gross cost of farm products and the more fully they are developed, the less that weather conditions and soil are allowed to clog the flow of traffic, the greater will be the health of the body politics and the added profusion of enjoyments and privileges to the common people.

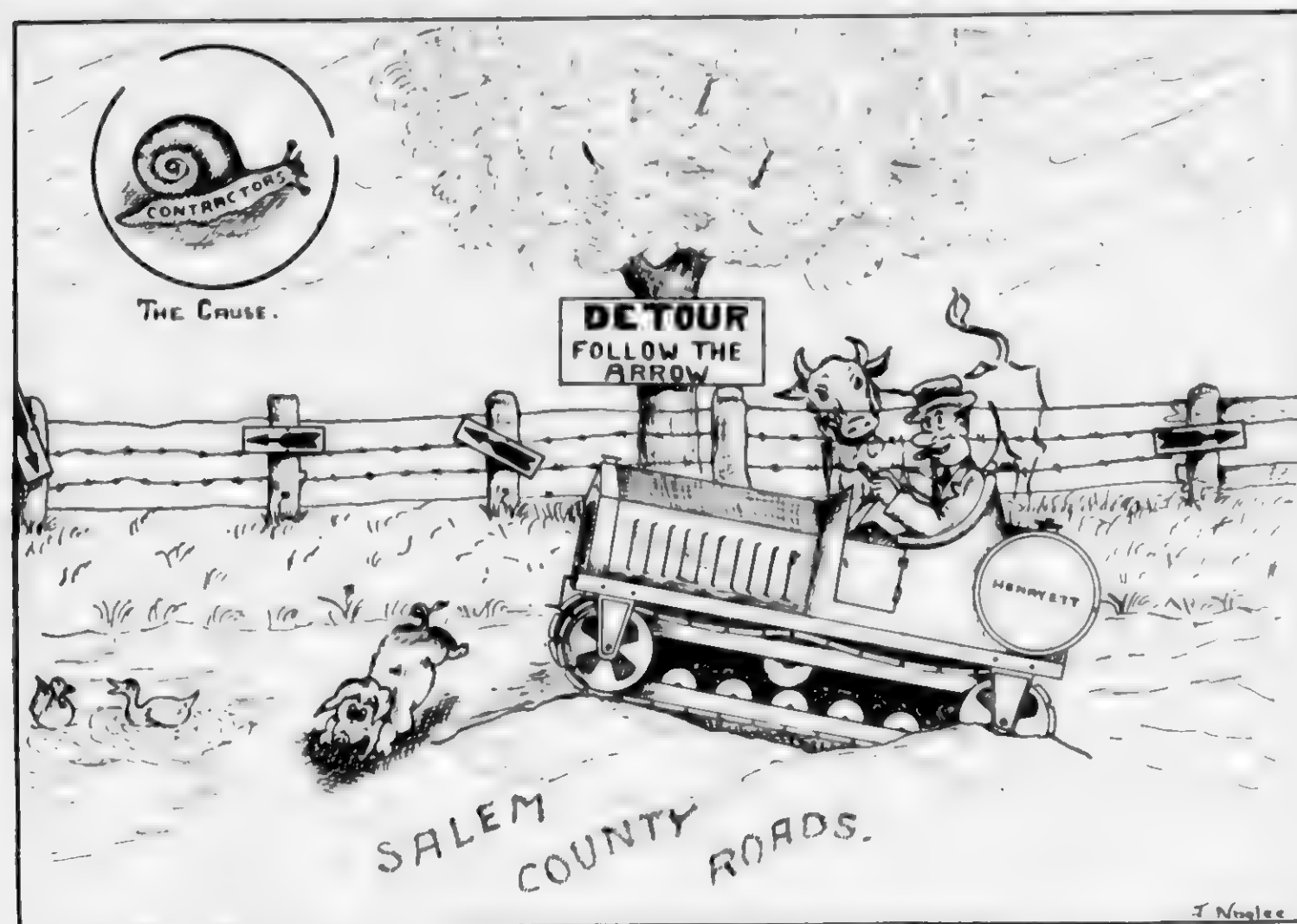
The loss from bad roads should be reduced to a minimum, not only to enlarge the farmer's market but to shorten the time and reduce the spread of price between the farmer and the consumer.

The farmer ought to be able to haul to market twice as much twice as often as he has been able to do in the past. If the farmer is to be put in a position to help influence the price of his products by not dumping them on the market for fear of unseasonable weather, he must control the condition of the roads to his markets. Without proper road conditions "orderly marketing" can never be accomplished. Rapid growth of traffic over the highways has been so greatly intensified during the past few years that this method of transportation needs earnest and careful consideration.—Resolution passed at the National Agricultural Conference at Washington, D. C.

One way to get good out of bad is to pave the road.



# The Highwayman of New Jersey



—Salem Standard & Jerseyman.

## What Is The Trouble?

Public Cannot Understand Why More Pep is Not Shown in Road Work

Users of the roads in Salem county that are under contract to be reconstructed during the next few months are greatly concerned because of the delay in starting the work. This concern is more among the farmers who know that the longer the contractors are in making a start and rushing the work to completion just that much longer will they have to detour in getting their produce to Salem and elsewhere. This delay will be a serious handicap especially during the potato and tomato season, which is not far off. The detour roads, too, are none too good and unless kept in better condition the farmers will have to do some juggling to keep their tomatoes and potatoes in the baskets.

Just what is causing the delay is not explained. It is no fault of the State Highway Department nor of the Board of Freeholders. There has been no scarcity of labor, no obstacle in the way of securing materials, and certainly car shortage cannot be pleaded. There is a penalty clause attached to each contract, which provides that the work shall be completed within a specified time and the Freeholders will be derelict in their duty if they do not enforce it. Some of the contractors have lost several days of excellent weather as it appears to us that the force employed is not as large as it should be. We are not road builders, but a layman can see that something should be done at once to get a little more pep into the work.

The Engineering force of the county worked days and nights to get the plans and specifications for these roads finished, having in mind the annoyance it would be to the farmers if the roads were torn up and unfit for travel during the busiest season of the year.

The Quinton-Marlboro contract was awarded on March 8th and the Masterson Construction Company is at work and has graded and filled in on part of the route and made the cut at Burden Hill. On the same date the Salem-Quinton road contract was let as was the contract for the rebuilding of the bridge near the Keasbey farm, but it was not until last week that work on the latter was actually started. It is true that the causeways at Quinton and on the Salem end have been filled and the trees razed and the road rooted. On February 8th the contract for the Shirley-Oldmans creek road was also let but the contractors have just about got started. It was on April 12th that the Salem-Woodstown road contract was awarded but little

progress is being made on that highway. The Pennsville-Salem road and the Peck's Corner-Cohansey road contracts were given out on May 10th and it is hoped the contractors will start soon.

The delay in rushing these roads to completion will mean that this summer Salem will be practically shut off from the use of all its main roads—Salem to Woodstown, Salem to Quinton, Salem to Pennsville.

If the authorities take any steps to make the contractors speed up, they also should get busy themselves and see that the travelling public gets some relief from the miserable detours that exist through some sections. To travel over some you need the filling pretty solid in your teeth to assure it staying in before you reach your journey's end.

We don't know who designated these detours but there is one in which it seems that poor judgment was shown. We refer to the detour from Alloway to Salem. The signs show that you leave Alloway and go via Alloway Junction over into Mannington and thence down by the Pointers to Salem. A far shorter route would have been directly from Alloway through Muttentown woods to Salem. There has been some unjust complaint about the condition of the latter road. It is not a designated detour by the State, consequently no money will be spent on it by the State Highway Department, but the Board of Freeholders certainly would be justified in expending some money in having the road scraped from time to time so that it will make better and shorter travelling to the county seat from Alloway.

While on the subject of roads and in fairness to the road contractors, it is well to remember that "people who live in glass houses should not throw stones." Take the road from Shirley to Elmer. Have you been over it lately? Well, if you can pick out a smooth place on it you are an expert. We understand that the Freeholders have authorized money for the maintenance of this road and have authorized the road improved, but if anything has been done it is not noticeable. It would be well for some of the Freeholders to take a ride over the county roads oftener. It is well to visit other States to inspect the types of road materials used, but Freeholders should know their county first.—The Salem Standard & Jerseyman.

## When Spending Is Economy

Should the "Good Roads Bill" which has passed the house also get through the senate, as seems very probable, and receive the approval of the president, as appears certain, it will be another example of spending money that is economy. The bill carries an appropriation of \$65,000,000 for this year and \$75,000,000 for next year for the construction of good roads throughout the country.

It is noteworthy that this bill carries a greater amount than the usual waterways bill, and with reason. While the improvement of our waterways is essential to the proper development of transportation, yet the land transportation is infinitely more important. The auto has made the good road a necessity, as transportation of freight and passengers by auto is becoming so general that it is having an effect on the railroad situation.

There is another notable thing about this bill—there has been no charge or suggestion of "pork" about it. The river and harbor bill has been a stench for many years. It has been the last resort of the "pork hunters," and it has been drafted and passed by log-rolling methods that savor of other days, rather than the twentieth century. But the good roads legislation has been free from this charge because the provisions are different. The river and harbor bill may carry an item of \$100,000 for the improvement of Squeedunk creek, near Podunkville, and that gives the congressman from that district a few plums to distribute, as well as showing the home folks that he is on the job. In the matter of good roads, government appropriations are only available when the states do their share, and the states in turn pass the bill along to the communities benefited. This puts the matter on a fair and business-like basis.

Good roads can do more for a community than anything else. Without good roads it is impossible for a town to progress. The visitor of today looks at the streets and the roads and if he finds them in bad condition he passes the

town by. Good roads mean bringing goods to market at less expense, reduce the cost of living, increase the profits of the farmers, bring the rural population to town more often—put the town on the map. Money expended for good roads is not an expense, but a very profitable investment. It is real saving, and while there is a very general demand for economy in government expenditures, it is very certain that the appropriation of this bill will meet hearty approval and that the states will not be slow to take advantage of the opportunity offered to secure aid to better highways.—Trenton (Missouri) Times.

## "Flivverboobs"

Reckless and careless drivers of automobiles are to be known as "flivverboobs" according to the decision reached by the judges deciding the American Automobile Association's contest to pick a name describing the reckless car driver in the same manner that "jay-walker" describes the careless pedestrian. The name was suggested by F. B. Simpson, of Cedar Rapids, Ia., who will receive the \$25 in gold offered as a prize by the A. A. A.

More than 10,000 names were submitted in this contest and the suggestions came from all parts of the United States. The committee selected to pass on the suggestions consisted of Col. C. O. Sherrill, head of Public Buildings and Grounds, Washington; Dr. Frank W. Ballou, superintendent of Public Schools, Washington; Inspector Albert J. Headley, head of the D. C. Traffic Department; Charles W. Semmes, president of the Semmes Motor Co., and Isaac Gans, prominent Washington business man.

The contest attracted nation-wide attention and the answers were of many varieties, including some who declared that it would be impossible to describe a reckless and careless driver in language that would go through the mails. The prize has been forwarded to Mr. Simpson.



In front of Seaview Golf Club, near Atlantic City, (Route 4)

## Warrenite—Bitulithic Pavements Have Stood Up Under Heavy Traffic For 15 Years

The test of the paving is in the riding—and the cost of upkeep. Upon either of these points we invite your critical investigation. Some of the oldest paved roads in New Jersey were laid under the Warren patents. Many of these have been in constant use under heavy traffic for fifteen years. They are still in excellent condition.

"The Best Road You Can Buy Is the Cheapest in the End."

**Warren Bros. Company**  
District Office 50 Church Street, New York City, N. Y.

WHEN YOU ORDER

**Dragon**  
PORTLAND CEMENT

The Cement you get is good.

It is also uniform.

Your order is filled promptly.

In a word—you get the kind of service you have a right to expect.

*"For Cement you can depend on—use Dragon"*

**Lawrence Cement Co.**

PHILADELPHIA

302 Broadway, NEW YORK

## The Skid-Proof Road

—is Concrete.

Its even, firm, gritty surface prevents slipping even in wet weather.

It is the necessary complement to good tires and good brakes, for complete responsiveness in your car.

More and more motorists are insisting on Concrete roads —and motorists can get the kind of roads they insist on.

*Send for our free booklet R-3,  
Facts about Concrete Roads*

**PORTLAND CEMENT ASSOCIATION**

347 Madison Avenue  
NEW YORK

*A National Organization to Improve and  
Extend the Uses of Concrete*

Offices in 23 Other Cities



## GLUTRIN

Four Reasons Why

**All**

**Gravel Roads Should Be Treated With Glutrin**

First: Glutrinized gravel roads are hard all the year round.

Second: Glutrinized roads shed water —and for that reason they do not rut up during the winter and Spring.

Third: Glutrin is the best binder yet discovered for gravel stone, sand-clay, or slag or earth roads.

And finally: Glutrin is not only the best binder, but by far the most economical.

### *What Local Authorities Think of Glutrin Road Binder:*

*Taken from the Daily Pioneer of Bridgeton, N. J., Tuesday, February 14, 1922*

#### "SHOWS VALUE"

"Last fall the state highway department caused West Commerce street to be flushed with glutrin, an oil-like preparation which has for its object the removal of the dust and preventing the gravel on the roads to be cut up with the traffic. The glutrin application also has had the effect of giving the street a surface which turned much of the water, and the results show a very much improved condition this winter. While most of the gravel streets are soft with mud, West Commerce street is comparatively firm and free from mud, and much smoother in consequence. The experiment would seem to indicate that the glutrin application greatly improves dirt roads."

Glutrin has been manufactured by us in our own plants for over 15 years. We have our own tank car line in which to deliver the product. The material used in New Jersey was applied by Mr. M. R. Young, Trenton, N. J., with pressure distributors especially built to handle this product.

Send us your name, and let us put you next to Glutrin!

**Robeson Process Company**  
Fifth Avenue Building, 200 Fifth Avenue, New York



Mr. Property Owner==

*Wouldn't you pay  
fifty cents a week  
to change from  
this ————— to ————— this*



The above pictures are actual photographs of Redford Avenue, Cranford, N. J., before and after it was paved with a "Tarvia-X" Penetration Pavement.

Instead of wading through mud all winter and breathing choking dust all summer the home owners on Redford Avenue now enjoy a smooth, hard, dustless and mudless pavement 365 days in the year.

And all for the nominal sum of about FIFTY CENTS A WEEK additional taxes on each fifty foot front lot.

Would you like to live on a Tarvia street? Would you like to benefit by the increased market value that such a street would give to your property?

If so, the experienced engineers of our Special Service Department can help you. These men have given years of study to road problems. Their advice and assistance may be had for the asking. If you will write us regarding road conditions in your vicinity, your letter will be given prompt attention.

Tarvia is a coal tar preparation made in a number of grades to meet varying road conditions. It is the most popular road material in America and has solved the problem of low cost, traffic-proof roads and pavements for hundreds of towns throughout the country.

# Tarvia

*For Road Construction  
Repair and Maintenance*

**C. C. RANDOLPH**  
Telephone 2466, PLAINFIELD, N. J.  
**ASHLEY BURNER**  
Telephone 2232, PLAINFIELD, N. J.

The *Barrett* Company  
40 RECTOR ST., NEW YORK CITY

C. A. BAKER, JR.  
Telephone 323, CLOSTER, N. J.  
H. M. SMITH  
Telephone 96M, RIVERTON, N. J.



## When Vulcan Made 'em, They Lasted Forever

The tunnel was excavated by the method of air shafts, and the shafts were driven from the surface. The tunnel was excavated by the method of air shafts, and the shafts were driven from the surface. The tunnel was excavated by the method of air shafts, and the shafts were driven from the surface. The tunnel was excavated by the method of air shafts, and the shafts were driven from the surface.

"*Let's go to the other side. Come on.*"

VULCANITE PORTLAND CEMENT CO.

PHILADELPHIA

BOSTON

NEW YORK



“EDISON”

## The Word that means "Cement Satisfaction"

Why not put your cement troubles up to Edison?  
Why fret and worry and **lose money** on slow deliveries, when  
we can ship your order the same day as received?  
Do you realize that Edison Cement is produced right here in  
New Jersey; and that we can ship 150 **carloads** a day?

**"Edison service—Cement when you want it!"**

EDISON PORTLAND CEMENT CO.

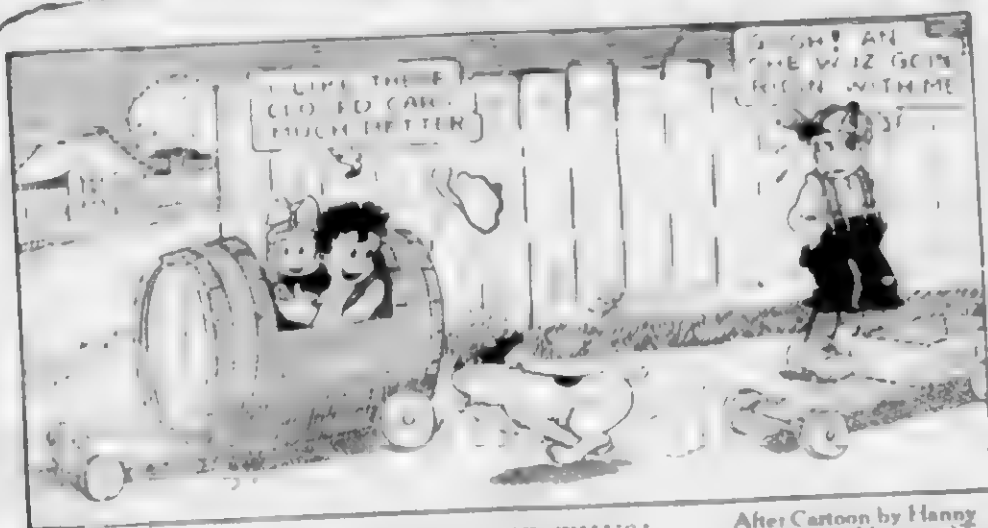
NEW YORK

BOSTON

PHILADELPHIA

PLANT: NEW VILLAGE, N. J.

# ALONG THE ROAD



"T'WAS EVER THUS!  
"Slimmy" has his first experience with the fickleness of the female of the species!"  
After Cartoon by Hanny in Trenton (Missouri) Times

## The Golden Rule - Even on the Road

The columns of the Highwayman have contained many articles on what is being done to reduce the dangers of driving on the roads—a national system of hand signals; danger signs; "light-houses" that flash warnings, etc., etc. But after all, there is no one thing that can so much reduce accidents on the road, and so much make for safety and comfort as the general application of that old—but still golden—rule: "do unto others as ye would they should do unto you."

If everybody would keep that in mind when driving, it would do more than anything else in the world to eliminate both accidents and those disagreeable happenings which often take much of the joy out of driving.

Just put yourself in the other guy's place and you will never try to hog the road, or "take a chance" that compels someone else to stop his car or burn out his brake bands to prevent an accident as a result of your recklessness. Don't always try to claim the "right of way"; even if you lose a half a minute by letting him go first, you'll find it worth while to carry away with you the memory of a smile from your brother motorist, instead of the rankling recollection of a scowl, or mumbled curse.

Be human; treat the other guy as you would like to have him treat you—and, nine times out of ten, you'll find the miracle will come to pass that he will treat you with the same consideration!

## More Truth Than Poetry By Cordoray Ike

Remember that the traffic cop, or the state police chap is only doing his duty when he insists on protecting you from other drivers as reckless as yourself.

### At Last He's Gone Before

There was a guy who always tried  
The car ahead to pass—  
But now he's resting quietly,  
Where he can't step on the gas.

It's funny that the man who cusses most about not having hard-surfaced roads to travel on, is always also the one who yells loudest when he has to "detour" when a road is under construction. It's funny—but it isn't logical.

### Jim Rests in Pieces

Jim Hurry always took a curve  
On the inside; but 'tis said  
That now at last he's lost his nerve—  
Because he lost his head.

### An Invitation

An autoist, after being held up by highwaymen, beaten, robbed and left along the roadside, upon recovering from his experience, found himself sitting opposite a sign which the Board of Trade from a nearby town had put up and which read: "Thank You—Come Again."



Along Route 13, Princeton-Trenton; a succession of beautiful views

# The Highwayman



Route No. 13, North of Kingston

The Highwayman Is Out  
For More and Better Roads  
in New Jersey

July, 1922  
Vol. I  
No. 12



## "Your Efficiency Increases in Proportion to the Square of Your Radius"

(A Little Lesson In Arithmetic Which It Will  
Pay You To Put In Your Pipe and Smoke)

About the weakest, most helpless thing in the world is the human animal.

Stripped of those inventions which his fertile brain has mothered, left to fall back on his own naked resources, he would not be a match for a yellow dog in the street.

The secret of man's achievements is that he has learned to multiply the faculties with which Nature endowed him. The muscles of his arm, so puny compared to those of an elephant, applied to a compound lever or a chain of gears, exerts a force capable of rending the elephant limb from limb. His voice, picked up and reinforced by the ether waves, circles the continents of the globe. His thoughts, multiplied a million times by the magic of print, can overthrow kingdoms and revolutionize social systems. Thus, through the entire category of his faculties.

But the one thing which it has been most difficult to multiply is the use of—time.

How often you have heard, or used your-

self, the expression "If I could only be in two places at the same time!"

Of course, you can't do that. But the nearer you can come to doing it, the more you can achieve. Your efficiency increases in proportion to the ground you can cover. And the ground you can cover increases in proportion to the square of the distance you can travel: attending to your business, whatever that business may be. For example, the grocer, who, with trucks and good roads, can deliver to his trade within a radius of twenty miles, is capable of serving a territory sixteen times as large as he could serve with a horse and wagon, and a five mile radius.

The same applies equally to rich man, poor man, beggar man and thief, doctor, lawyer, merchant, chief.

All of which is only another way of proving that a good road is worth all its costs—and a lot more.

—Q. E. D.



# The Highwayman of New Jersey

## The Highwayman

Published Monthly By The  
State Highway Department, at Trenton, N. J.  
The HIGHWAYMAN will be sent free upon application  
to any citizen of New Jersey who is interested in  
"More and Better Roads For New Jersey."

### THE HIGHWAYMAN

H. C. SHINN, Editor in Chief

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A. LEE GROVER R. B. GAGE  
C. F. BIDWELL EDWARD E. REED

#### Chief Editor

Managing Editor  
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3rd Vice Pres.	WILLARD EMMONS, Equipment Div.
4th Vice President	G. R. MOORE, Right of Way
5th Vice President	WM. J. MCGOVERN, State Labor
6th Vice President	H. D. ROBBINS, Construction
Executive Secretary	EDWARD W. O'BRIEN

## Let Us Hear from You

164 Madison Ave., Elizabeth, N. J.

### THE HIGHWAYMAN

Gentlemen:—I acknowledge with thanks the copy of the March Issue of THE HIGHWAYMAN. Have found it more than interesting, containing reports of the condition of our state roads. Although I do all my motoring on Saturday and Sunday, I travel over our own Jersey roads more than any other, and as a citizen of this state all my life, there are no roads that satisfy me more than New Jersey roads. I am sure very few people realize what it means to keep the highways in good condition, when they are traveled so heavily by trucks.

May I ask that you kindly put my name on your regular mailing list and if I can be of any assistance to you, I am at your service.

A town whose roads are in bad condition hardly ever advances very much. To this I am sure you will agree.

Trusting you will accept this letter in good faith and with the spirit of a New Jersey booster, I am,

Respectfully,

EVERETT B. CRAIG,  
164 Madison Ave., Elizabeth, N. J.

Phone—Eliz. 1569-R.

Mr. Everett B. Craig,  
164 Madison Ave., Elizabeth, N. J.

April 21, 1922.

Dear Sir:—Your letter of recent date commenting on the manner in which the roads of New Jersey have been maintained acts somewhat like a tonic when one considers how easy it is to complain of the maintenance of the roads.

In order that we may encourage the men in the Department to keep up the standard they have already attained, I am arranging to have this communication appear in the HIGHWAYMAN, which will appear in the July Issue, providing I do not hear from you requesting me not to do so.

Assuring you of my appreciation of the thought you had when you wrote me your letter, I remain

Very truly yours,

T. J. WASSER, State Highway Engineer.

TJW/O'B.



Roy Mullins

He Helped Build the Grand Central Station  
in New York

Roy was born at Baldwinville, Massachusetts, October 9, 1884. Educated at Dartmouth College, B. S. 1907; Thayer School of Civil Engineering, a graduate of Dartmouth College, C. E., 1908.

Spent two years with Elliott C. Brown Company of New York City on construction work in Long Island, Connecticut and Massachusetts. One year on construction work with N. Y. C. & H. R. R. at Grand Central Terminal, New York City.

One year on construction work with Erie Railroad in Ohio. One year on construction work as a draftsman in drawing, descriptive geometry and surveying in Dartmouth College and the Thayer School.

Entered N. J. State Highway Department April 1, 1913, as Right of Way Engineer. August 1, 1914, Division Engineer in the Southern Division. March 18, 1919, Division Engineer in the Northern Division. November 1, 1921, in Office of the Construction Engineer at Trenton.

### STATE OF NEW JERSEY

### DEPARTMENT OF WEIGHTS AND MEASURES TRENTON

May 18, 1922.

Mr. H. C. Shinn,  
Editor-in-Chief, "THE HIGHWAYMAN",  
State Highway Dept., Trenton, N. J.

My Dear Mr. Shinn:

Through the courtesy of your Department we have been receiving "THE HIGHWAYMAN"—it's a dandy! You fellows are certainly to be congratulated upon the splendid work you are doing.

I see quite a lot of favorable mention of the manner in which the roads were kept open during the past winter; the expressions of commendation are well merited. Good, open roads all the year through benefit not only the individual, but go a great way toward expediting the work of various branches of our State government, ours among them. Winter has in the past meant a "slowing up" of many of our sixty weights and measures men throughout New Jersey, due to bad traveling conditions; when they can work, they are "on the go" all the time. The "resting up" period for them is getting to be a thing of the past; their reports now show they are able to keep going all through the winter season. Last year was our banner year for results—the biggest since the department was established back in 1911; the good roads contributed largely to this.

And not least among the other good things you have done is the fine co-operation given this Department which I assure you is deeply appreciated.

Yours very truly,

/s/ Jos. L. ROGERS, Secretary.



Robert A. Meeker

Engineer in Charge of Surveys and Right of Way

Mr. Meeker is a graduate of Rutgers College and has the academic degree of B. Sc., M. Sc.; and C. E. He served one year with the New Jersey State Geological Survey. He then followed mining engineering for ten years in the South and Southwest and the West.

Mr. Meeker was Engineer in Charge when Union County built the first system of roads under the County Bonding Act, entailing a total expenditure of \$100,000. He was Street Commissioner and City Engineer of Plainfield for seven years, after which he was engaged in private practice for two years. Mr. Meeker entered the employ of the New Jersey State Highway Department in July, 1900, the title of the office at that time being State Supervisor of Roads. (This was later changed to State Highway Engineer.) He served in this capacity until April, 1918. After private practice until October, 1920, Mr. Meeker was made Engineer in Charge of Surveys and Rights of Way, which position he now holds.

## Highwaymen Turn Firemen Jack Edwards to the Front

Rightmire Home at Deans Saved From Flame

One of the hottest fires that has occurred on the Georges Road in years broke out yesterday morning at the Rightmire farm at Deans. The conflagration resulted in the destruction of seven outbuildings, one of which was the original Rightmire homestead. The spacious home of the family was saved from destruction.

Simultaneously with a fire alarm being sent to Cranbury for assistance, the employees of the State Highway Department under Alfred Kerr, who has charge of Route No. 1, south of New Brunswick, were called. Both departments responded promptly and were soon at work fighting the flames which were spreading rapidly. While the Cranbury Fire Department poured chemicals on the flames the highwaymen turned a bucket brigade and did effective work.

While the flames were eating their way toward the big home of the Rightmires, Supervisor John T. Edwards, of the highway department and a brother of Governor E. I. Edwards, reached the scene. He immediately took command of his men and urged them on in battling the flames. He was covered with mud and soot when he departed and was also drenched.

During the fire the home of Justice of the Peace Walters, of Deans was threatened several times.

It was reported that sparks from the saw-mill opposite the Rightmire and Walters homes were responsible.—New Brunswick Daily Home News.

To the Members of the  
State Highway Department.

Permit me to thank you all, for Mr. Fishberg and myself, for your very sensible wedding gift.

I can assure you we both appreciate it very much.

Very cordially,

MRS. CHARLES FISHBERG.

April 17, 1922.

## NEW JERSEY STATE HIGHWAY DEPARTMENT

March 18, 1922

### Executive

H. I. EDWARDS, Governor

The State Highway Commission

and

THOMAS I. WASSER, State Highway Engineer

### ADMINISTRATION

A. LEE GROVER, Secretary and Chief Clerk

M. L. HOWELL - Chief Auditor and Accountant

CHAR. FISHBERG - Assistant Chief Clerk

MISS GRACE WILLIAMSON - Chief File Clerk

R. W. WILDLWOOD - Purchase Clerk

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G. R. MOORE, Asst. Construction Engineer

R. A. MEYER - Right of Way Engineer

C. A. MIDD - Bridge Engineer

THOMAS GEORGE - Acting Supt. of State Labor

C. A. BURN - Northern Division Engineer

H. D. ROBBINS - Central Division Engineer

J. A. WILLIAMS - Southern Division Engineer

### MAINTENANCE, EQUIPMENT AND PROJECTS DIVISION

EDWARD E. REED, Assistant State Highway Engineer

A. W. MUIR - Superintendent of Maintenance

JACOB HAGIN - Superintendent of Plant and Equipment

N. C. APPELGATE - Supervisor of Equipment

A. D. BULLOCK - Projects Engineer

H. C. SHINN - Engineer of Special Assignments

### TESTING LABORATORY

R. B. GAGE, Chemical Engineer

J. G. BRAGG - Senior Testing Engineer

F. H. BAUMANN - Senior Testing Chemist

## Fatal Accident on Route 6

Harry N. Becker Met Death In Trying To Save  
the Lives of Some Small Children

Harry N. Becker, of Westville, New Jersey, Bridge Tender on the Big Timber Creek Bridge on Route No. 6 was killed recently while acting in the performance of his duties, in an attempt to halt a runaway team of horses which was endangering the lives of some small children in the vicinity of the bridge.

From the accounts of the accidents which we have received, it is understood that Becker warned the children who were endangered, and then made a valiant effort to bring the team to a stop. In doing so, however, he in some unknown manner fell and the wheels of the wagon passed over his body. He was immediately removed to his home and later to a hospital in Camden, where his injuries resulted in his death on the following day.

At the time of the accident, Becker was on the bridge in the performance of his duties, and in his effort to stop the team of horses, he most undoubtedly had in mind the protection and safeguarding of the traveling public and the small children whose lives were jeopardized by the runaway team.

Becker's beneficiaries will receive payment from the New Jersey State Pension Fund by reason of the fact that he had just recently joined. The initial payment has in fact already been made to his widow and she will continue to receive semi-monthly payments of half his salary for the rest of her life.

This is the first fatality since the pension system has been in operation and demonstrates the quick and practical relief to the beneficiary from this fund.

Miss Williamson admits that there is a great improvement in the filing work, the subjects are coming in better, but there is still room for great improvement.

**IRE YOU ON WHEN YOU'RE OFF**  
or  
**OFF WHEN YOU'RE ON?**  
When Ed. saved the bridge, he was "off duty".  
There are three types of men:  
Those who are on the job only when they are on duty;  
Those who are only half on the job even when they are on duty;



E. B. LOUGHRAN

## Loughran Saves the Bridge

But—  
Some Darn Fool Was Careless with a Match

One of our Detour Investigators, Ed. B. Loughran, saved the Amboy Bridge from a serious fire and possible had tie up of the very heavy traveled State Highway (Shore) Route No. 4, when he discovered smoke coming from under the bridge Sunday, June 11, 1922. Ed immediately notified Bridge Engineer Stephen Bashoda and Traffic Officer Mashusky, who in turn sent in an alarm to the South Amboy Fire Department. Loughran also gave the alarm to a State Police Motorcycle policeman.  
In a few minutes both the Perth Amboy and the South Amboy Fire Departments were on the scene and the fire

was soon extinguished. The old bridge would probably have been an easy prey to the flames but for the prompt action. A stiff wind was blowing at the time.

Loughran's action is particularly commendable because the bridge was no particular responsibility of his and he might have ignored the smoke as probably unimportant and continued his Sunday outing with his family.

This incident shows us that people using this and other timber structures cannot be too strongly warned against throwing lighted cigars, cigarettes or matches upon these structures.

And those who are "on" all the time, whether their time card is punched "in", or not.  
It is those in the latter class who generally happen to be the "lucky" guys who eventually get "something better."  
Maybe it's mere coincidence; probably it isn't.  
To which class do YOU belong?

## Governor Edwards Appoints Board of Engineers

Governor Edward I. Edwards, on March 17th, 1922, appointed a State Board of Professional Engineers and Land Surveyors, the personnel of which follows:

Thomas J. Wasser, State Highway Engineer, Trenton, N. J.  
George H. Noble, Asst. City Engineer, Clifton, N. J.  
Harvey Snook, County Engineer, Sussex County, New York, N. J.  
John C. Remington, Jr., Consulting Engineer, Haddonfield, N. J.  
Hugh A. Kelly, Engineer and Architect, Dept. of Parks and Public Improvements, Jersey City, N. J.

The Act creating this Board was made possible through the efforts of the professional engineers in the State of New Jersey, the object being to safeguard the life, health and property of citizens.

Engineers and Land Surveyors in order to practice in the future, must submit to the Board satisfactory evidence that he or she is fully qualified to practice professional engineering or land surveying.

The need of regulation of engineering practice has always existed, as will be realized by the number of lives that daily depend upon the safe and proper design and construction and the immense amount of money involved in engineering projects. The public would have no assurance of the safety of bridges, buildings, dams, tunnels, railways and numerous other engineering works and investors would have no assurance of the economy of the design of such structures in which their funds are invested, without a law providing for licensing the engineers who are responsible for the design and construction of these public works.

The passage of this licensing act was sponsored by reputable professional engineers, in order to safeguard the public who as a general thing are inclined to accept every new bridge or other structure thrown open, as being safe without realizing the chances of fatal accidents occurring due to lack of regulation and provision for the fixing of responsibility upon men competent to design and supervise construction.

No one giving thought to the matter would engage a lawyer when not admitted to the bar, a dentist or physician, or an architect who had not been licensed. There is as much reason to examine and license professional engineers and land surveyors as any of the above mentioned professions. It is now necessary for everyone to be licensed to practice in the State of New Jersey who through technical knowledge gained by education and experience in one or more branches of engineering, initiates, investigates, plans and directs the application of the resources of nature to the use and convenience of man and who represents himself or herself to be such an engineer whether through the use of the term engineer with or without qualifying adjectives or through the use of some other title implying that he or she is such an engineer.

Land Surveying as covered by the Act, covers surveys for the determination of areas or for the establishment or re-establishment of land boundaries and the sub-division and platting of land, and it is necessary for all persons who conduct such surveys, to apply to the State Board of Engineers for a license.

Although only appointed the latter part of March, the State Board of Engineers has lost no time and is now ready to receive applications from those desiring to practice professional engineering and, or, land surveying in New Jersey.

A fee of \$25.00 must accompany an application for license to practice Professional Engineering and a fee of \$25.00 must accompany an application for a license to practice Land Surveying. For those who desire to practice both Professional Engineering and Land Surveying, the fee to accompany the application is \$35.00. There will be an additional nominal charge for filing the license with the Secretary of State and for the seal, etc.

Requests for application blanks should be addressed to Hugh A. Kelly, Secretary, 710 Trust Co. of N. J. Building, Jersey City, N. J.

THOMAS J. WASSER, President.  
Trenton, N. J., April 17, 1922.

G. R. Moore is Assistant Construction Engineer.

He likes, or rather sleeps at Manassquan. When this photo was taken, the dog was putting up a strong argument to G. R. attempting to persuade him that he should stay home nights instead of burning up New Jersey roads, working overtime for the Highway Department.



G. R. MOORE  
Assistant Construction Engineer

Mr. Moore took a vacation last month, first in many years. If you happen to see a dog G. R., please don't mention the fact that you saw his picture in the Highwayman, as the photo was supplied, without his knowledge, by Mrs. M., and we wouldn't like to be responsible for starting anything.

## State Highway Engineer Given Testimonial Dinner

A testimonial dinner was given to Mr. T. J. Wasser on July 1st, in honor of the second anniversary of his appointment as State Highway Engineer and at the Dedication of the new State garage known as the Fernwood Service Station.

Dinner was served in the new garage, after which musical selections were rendered and talks given by members of the Commission, guests, and Mr. Wasser himself. We are giving Mr. Wasser's speech below:

"Mr. Toastmaster, Members of the State Highway Commission, Guests, and Fellow-Workers of the State Highway Department:—

"The dedication of this service station marks an epoch in the history of the State Highway Department, which is the culmination of our two years' work since my appointment. This dinner tendered me in connection therewith and the wonderful tributes paid me by the speakers, together with this token which you have presented me, prevents me from concentrating on words that fully express my gratification at the wonderful results obtained by our organization in the carrying out of its part of the program to give New Jersey the finest highways in the country.

"Two years ago my first impression of the work before me was to secure cooperation, which could only be obtained through organization, and I find today that I have no complaint whatever to make for a lack of cooperation and what we have is an organization that is only necessary to keep moving to get the results desired. The cooperation has been both on the part of the Commission, who have sustained my judgment, and the employees of the Department, from the heads of the divisions to the lowest paid man, who have worked constantly carrying out my judgment.

"Right here I might quote the words of the Chairman of the Highway Commission, when he writes for the HIGHWAYMAN:—

"The aim of the New Jersey State Highway Commission is to promote the enthusiasm of every officer and employee in behalf of a high standard of public service, for it is the men of the State Highway Department who, by ability, loyalty, initiative, and faithful work, make the service what it is."

"Commenting on the above remarks of the Chairman, we have tried to serve the public, and have not been annoyed by complaints. Some two years ago, complaints were numerous. Today, several letters that reach us are of commendation.

"I accept them on your behalf, as it is you men who are responsible for the results. The Equipment Division, to my mind, is a silent partner of the Maintenance Division. If the roads are maintained in such shape as to bring favorable comments from the motorists, you never hear a word about the part the Equipment Division played in it, although they are a very important factor in the success of the maintenance men, and only through the cooperation of the two divisions is it possible to bring satisfactory results.

"Should we keep the organization intact as we have it today, it will only be a short time before all the highways in the State will be in such a serviceable condition as to satisfy the traveling public. If we fail in organization then all our individual efforts are lost. The pulling for one another is the key-note of success.

"If the cooperation of our organization will continue as it has, it will give us a reputation second to no organization in the country.

"In closing, I wish to thank everyone for this beautiful gift, and long after I have relinquished my position in the Department, I will cherish it as a token from men who supported me in our efforts to succeed, not forgetting the efforts of the Equipment Division."

## An Identification Card for Highwaymen

The country is filled with books on Who's who "this", and Who's who "that" so that it is only right for the HIGHWAYMEN to be properly known when they try to hold up traffic passing over construction jobs, or go on private property for the purpose of survey and staking.

The new Identification

STATE OF NEW JERSEY  
STATE HIGHWAY COMMISSION

I, THOMAS J. WASSER, State Highway Engineer, do hereby certify that

**HARRY C. SHINN**

CHIEF EDITOR "HIGHWAYMAN"

is an employee of the New Jersey State Highway Commission and as such is governed by "An act to establish a State Highway Department and to define its powers and duties, and vesting therein all the powers and duties now devolved by law upon the Commissioner of Public Roads, and the existing State Highway Department and Highway Commission" (Chap. 15, P. L. 1917.)

1922

*[Signature]*  
State Highway Engineer

Card was designed by our Chief, Mr. Wasser, and has been approved for the use of the Highway Commissioners and all the permanent employees of the Highway Department. It will bear the original signature of each employee, and will be carried until the employee leaves the service of the Department. The card must be turned in when the service is at an end.

CHARLES FISHBERG,  
Asst. Ch. Clerk.



# The Highwayman of New Jersey



CHARLES M. REEVES  
Inspector

THE HIGHWAYMAN,  
Broad St. Bk. Bldg.,  
Trenton, N. J.

Dear Sir:—The attached letter is self explanatory.

To the Laboratory Division and residents of Salem County the accompanying photograph needs no explanation. However, to the other members of the Depart-

ment and the public at large, I wish to introduce Mr. Charles M. Reeves, perhaps better known as "Cappy".

For any small favors or compliments received, the Laboratory Division is truly thankful, and we hold "Cappy" responsible for this one.

Very truly yours,  
/s/ L. G. BRAGA,  
Senior Testing Engineer.

## To Foremen, Equipment Operators, and Maintenance and Construction Men in the Field

Do you realize what was necessary in order that your checks might be delivered to you on the regular pay day period, the first of July, in view of the fact that July 1st was Saturday, a half day, July 2nd was Sunday, and July 4th was a holiday?

This meant that the last daily reports of the period had to be recorded, pay rolls prepared, time checked, and checks written and signed for 996 men in two and a half days of straight working time, which was a physical impossibility and necessitated the following men working overtime on Saturday afternoon and Sunday morning, and a part of the Fourth, for which time, being salaried men, they received no extra compensation, and which was purely a matter of loyalty to your interests:

Arthur Amission  
Clyde Case  
Joseph Sullivan  
H. C. Shreve  
Earle Leonard

The work was facilitated by the prompt submission of the Daily Reports and Time Books as requested in circular letter sent out the previous week by the Maintenance Division. We would particularly emphasize the importance of getting the Daily Reports and finally your payroll book and signed payroll to this office on the first day succeeding the closing of the pay period.

When approaching a railroad grade crossing, it is well to remember that the time to stop is *before* reaching the middle of the track.

High speed is glorious, but the fellow who wrote that, The path of glory leads but to the grave, said a real mouthful.—*American Motorist*.



BEFORE—1916

Route No. 12, Sec. 1, near Passaic River Bridge. Conditions shown in picture taken in 1916 represent those still existing in 1921, "Before" improvements were started. Picture on right shows same point "After" improvements were made.



AFTER—1922

## Re: Route 6, Section 10

L. I. Wasser, Esq., State Highway Engineer,  
Trenton, N. J.

Dear Sir:—I feel it my duty to call your attention to the results achieved by the material inspection which you have had made in Salem County.

The work on this road consisted in grading and repairing the gravel surface which would be later used for a sub-grade for a concrete road. It was of course necessary to use local deposits of gravel. Your Inspector, Mr. Reeves, located several pits and sent samples to the Laboratory for tests. The results of these tests were forwarded to me before the plans were approved and the pits were listed both on the key map and on the list of materials as sources of a supply of gravel which had the approval of the Laboratory.

In my opinion, this material reduced the bids on this road. We received bids from twenty contractors and practically all of them examined these pits before making their bids. It enabled the Contractors, when making their bids, to examine the pits and know definitely upon what length of haul they were bidding and also to obtain prices from the owners.

This work produced such results that I intend to show similar information on all plans for future work.

Very truly yours,  
(Signed) H. B. KEASBY,  
County Engineer, Salem County.

## Received by Mr. T. J. Wasser

By Radio,  
Saturday, July 8, 1922  
Broadcasting Station, FRB

At a time when another Highwayman was announced at 11 P. M. May years pass rapidly in order that he may take his rank among the other Highwaymen of the Department. Congratulations, Fred!



Route 13: Looking North, Just North of Kingston

## Along Your Highways

Under this heading is presented each month a description of the conditions along one or more of the main roads of the state. If you drive a car, you will be interested in following this series.

### Route No. 13

Starting from Trenton on the continuation of Route 13, known as Brunswick Avenue (the City of Trenton, a decided contrast of this section of Brunswick Avenue is to be noted over conditions of a couple of years ago. The pole banding which starts from the Battle Monument in Trenton directs traffic to the outskirts of the city and to the beginning of the highway route, the brown color indicating that the route is taken in a northeasterly direction. Just after crossing the City Line on the right the twenty ton auto truck scales built by the Department, to enable the Department of Motor Vehicles to regulate the loads of vehicles within the law and penalize those who are violating the law, will be observed. The weighing up of trucks at different points throughout the State by the Motor Vehicle Department has several beneficial effects. The one in which the Department most interested is that of preventing excessive loads from breaking up the roads which were not designed to carry them. The Department also benefits by the increased receipts of the Motor Vehicle Department on account of the increase in license fees necessary to conform with the law and the fines imposed for violating the law.

The condition of Route No. 13 from Trenton City Line to and through Lawrenceville is fairly good. Lawrenceville, one of the interesting pits along this route, is noted particularly for the Lawrenceville Preparatory School. The Route from Lawrenceville to Princeton has not withstood the heavy traffic which it has been subjected in the last year, it being very difficult to maintain any macadam pavement under such heavy traffic, and although this road was in good condition last fall, a combination of the heavy traffic and the poor drainage conditions caused partly by the alley road which parallels and is on the right of way this route causes the above conditions.

Maintenance forces are engaged in resurfacing this section and are working south from Princeton. The portion of about one mile and a half which has been scarified and rerolled with addition of new stone, offers a very good riding surface, with later addition of bitumen surface coat, it will take care of traffic conditions until something better can be done. Users of this portion of Route No. 13 (also the Lincoln Highway) certainly wish Alex. Muir and his forces speedily putting the roadway in good condition.

### Princeton—Beautiful Residential Town

Tourists will find Princeton a stop and a sight-seeing trip through the town and Princeton University. Princeton is one of New Jersey's prettiest residential towns, in addition to having a natty great university. The paving through Nassau Street excellent and the width of this thoroughfare offers an opportunity for parking

space on the side and the main traffic through the town. The construction of that section of Route No. 13 between the northerly boundary of Princeton and Kingston, completes the hard surfaced paving over Route 13 (also the Lincoln Highway) from Princeton to New Brunswick, with a short exception at Kingston just before the sharp right turn at the Kingston Mill, the hard surfaced pavement stops and does not begin again until the several bridges clustered in the valley, spanning the outlet of Princeton Lake and the Raritan Canal and the Railroad Crossing of the Rocky Hill Branch of the Pennsylvania Railroad have been crossed. At the top of the hill in the Town of Kingston, the hard surfaced pavement again begins and continues to New Brunswick.

A satisfactory solution of the road and bridge problem encountered in this section will necessitate the expenditure of a large sum of money. Several schemes have been tentatively considered, including the construction of a viaduct from the top of the hill in Kingston to the top of the hill, south of the Kingston Mill. Such a structure would necessarily be very costly.

Without considering this as necessarily the proper solution for the problem, it is nevertheless evident that any permanent solution will entail the expenditure of such a large sum of money that could for the present be expended to construct considerable road mileage. Conditions at this point are, therefore, being maintained in a passable condition until funds are available for carrying out a program of this magnitude.

### Difficult Engineering Problems

The construction of Route 13 with concrete pavement between Kingston and New Brunswick offered many engineering problems. At the top of the long grade about a mile and a half north of Kingston a straight course was laid out over new right of way to avoid several bad turns on the old road and very bad drainage conditions, also shortening by several hundred feet the length of the road. In one place for eighteen hundred feet at a point about three miles north of Kingston a very heavy sticky white clay was encountered, saturated with water, which had caused an impossible maintenance condition for years, previous to its reconstruction. This clay was removed to a depth of three feet below the road and a net-work of tile pipe laid in the bottom of the excavation, leading off to a small stream to drain away the water. The excavated portion was refilled with large rock taken from other parts of the work, sand and crushed stone, in order to offer a porous material through which the water would rapidly escape to the drainage system below, in order to keep from "freezing up and blowing up", the concrete pavement which was built thereon. Three or four miles further on between Franklin Park and New Brunswick for a distance of about two miles north of Franklin Park,

# The Highwayman of New Jersey



On Route No. 13 about a mile and a half north of Kingston looking both south (photo taken from top of hill which marks beginning of the new alignment).

the road is practically level. The highway at this point is on a divide of land, the ground sloping off in either direction at right angles to the road. A very poor drainage condition had existed through this two mile section for years as there was not sufficient flow to carry off the water from the surface or sub-soil. The solution of this drainage problem consists of a storm sewer starting in Franklin Park and running to a stream about two miles north, increasing in size sufficient to take care of surface and sub-soil drainage conditions. The parallel lines at frequent intervals, resulting in almost continuous flow of water entering the storm sewer. This drainage system has proven effective as no cracks have appeared in this section of the highway that can be ascribed to lack of adequate drainage. Another indication of the success of the drainage system is the fact that the residents of this farm community have stated that the level of their wells was lowered considerably after the drainage system was constructed. The storm water or surface drainage had to be taken care of by "Forced Grade U" Gutters". By forced grade is meant that the gutter runs on grades alternately up and down to catch basins at frequent intervals, in order to carry the water to the catch basin at which point it is emptied into the storm sewer. Under average conditions a road offers opportunity to be graded longitudinally in order to carry the water to some lower point where it runs off on the adjoining land or through a stream.

## They Made Money "Pulling Out" Autos

To drive over this route having been familiar with conditions of a few years ago, the contrast is strikingly apparent. It is known to be a fact that the residents along certain sections of this portion of the Lincoln Highway made considerable money by keeping their teams harnessed in readiness to pull out automobiles which became mired after sinking through the macadam road into the clay sub-soil in the spring. In some cases the macadam had been built to a depth of over two feet, by incessant dumping of stone at these points in order to try to overcome the instability of the road. The scenery offered along this road is of the very finest. A few pictures illus-

trating this are shown herewith. It is a very noticeable fact that on this route in particular and all roads in general, a high class road improvement, giving maximum possible utilization and a neat clean appearance has a very decided effect upon property owners, inducing them to paint their buildings, clean up their yards, and improve the condition and appearance of their farms and buildings to conform with the type of improvement made along the roadway. The increased value of the property due to all these conditions is apparent to any observer who has been familiar with conditions before and after."

Entering New Brunswick, ones reception in the way of paving is not of the best. The State Highway Act of 1917 provides that in cities over sixteen thousand population the State Highway Department may enter into an agreement with the governing body of the city for the improvement of the street connecting the highway route or routes between the city lines. The City of New Brunswick and the State Highway Commission are now in the preliminary steps looking to the improvement of the streets which carry the traffic from the State Highway Routes.

## The Reason For a "Reimbursement Plan."

Since the State Highway System has been established by the law of 1917, the State Highway Commission has pursued a policy of building from the funds received through the one mill tax, amounting to approximately \$3,500,000 per year, those portions of the State Highway System which were subjected to the heaviest traffic and, the paving, drainage and the conditions most difficult to maintain in a safe and good condition for the traveling public. The needs of construction were so much greater than the funds available that the provision of the highway act providing that work may be done through the reimbursement plan by various counties was resorted to, in order to span some of the worst gaps of the system with passable roads and bridges. The 1917 act providing that funds raised at the rate of one mill on the dollar of assessed value for a period of five years ended in 1922. These funds have been used up on road and bridge construction at the funds of 1923 are allotted to bridge work. The funds of 1924, 1925 and 1926 have

# of New Jersey



Route No. 13 about a mile and a half north of Kingston looking both south (photo taken from top of hill which marks beginning of the new alignment).

been obligated through the county reimbursement act, so that the Highway Commission finds itself in a position where it cannot undertake the reconstruction of portions of the highway system without the approval and instigation of the governing bodies of the various counties and municipalities. This condition must continue until proper legislation is enacted to enable the Department to be financed in such a way that such conditions can be overcome.

A law was passed by the Legislature in the Spring of 1922, providing for a referendum by the people of New Jersey at the fall election, upon an issue of bonds as needed, not to exceed eight million dollars per year, or a total amount of \$40,000,000, to provide for the completion of the paving of the highway system and rebuilding safe and adequate bridges where necessary.

## Improvements Being Made On Route No. 1

The extension of this route has been marked by brown pole bands from Chambers Street in Trenton to the City Line, indicating that it takes a general north-easterly direction. Route 1 parallels Route 13 in a general way. The present city pavement over Greenwood Avenue from Chambers Street is in very good condition. Upon reaching the city line, which is the beginning of Route No. 1, the pavement is in rough condition. An agreement with Mercer County has been reached, providing for the reconstruction of this section between the city line of Trenton and Nottingham Way at the Fair Grounds and contract has been awarded to Rees and Taylor.

The paving from this point onward through Mercerville to Hamilton Square is in very good condition and the section through the town of Hamilton Square is fast approaching completion by forces of Contractor Daniel Klockner, Junior. The Trenton and Mercer County Traction Company are raising their tracks to conform with the grade of the paving, preliminary to the paving between the tracks.

After these small sections are completed a continuous good pavement from the Trenton City Line to Hightstown will exist with the exception of a very short stretch through Robbinsville where lack of funds for the elimi-

nation of a very bad grade crossing prevents the completion of this short stretch of pavement.

The concrete pavement through Hightstown through cooperation of the borough was built from curb to curb which adds greatly to the appearance of the town and to the utilization of the highway, providing parking space along the curbs with fair width for through traffic.

## Co-operation By Towns and Cities Makes For

This progressive spirit on the part of towns and cities, in taking care of local traffic conditions as well as the through traffic is necessary, in order to adequately take care of the heavy, growing traffic needs. Leaving New Brunswick over Albany Street after crossing over the Raritan River the Borough of Highland Park is reached. The paving through Highland Park is somewhat rough and will be repaved under the reimbursement act this year.

The section of the highway from the northerly boundary of the Borough of Highland Park to Metuchen has been very difficult to maintain under the enormous truck traffic to which this Route (Also the Lincoln Highway) is subjected, with a bituminous concrete pavement on a macadam base. The very heavy maintenance cost on this road made it mandatory that reconstruction be undertaken at once, providing for a hard surfaced pavement with adequate drainage facilities. This will be done under the reimbursement act this year.

In Metuchen some will remember the left and right turns and steep grade over the four track main line of the Pennsylvania Railroad on the southerly approach to this town and the very bad paving conditions existing from this point through Metuchen. This dangerous overhead crossing has been eliminated.

The concrete pavement continues from Metuchen to Menlo Park, at which point the new alignment begins paralleling the four track main line of the Pennsylvania Railroad to Rahway. The old road made a sharp turn at Menlo Park and went underneath the four track main line of the railroad, a narrow dangerous one-way culvert making a very sharp turn a few hundred feet beyond the culvert and then, paralleling the railroad for a distance

[Continued on Page 11]



Route No. 13—North of Kingston looking south. Right, looking north along new road.



Route No. 1 West of Hightstown looking easterly (on right looking westerly)



## Contract News

Prepared to July 1, 1937

Feb. 6—Route 7, Section 1, Shirley Oldmans Creek, Reinforced Concrete Paving job, 0.81 miles, 20 feet wide with gravel shoulders, was awarded to the Benjamin Foster Company, Philadelphia, Pennsylvania, on their low bid of \$34,420.47.

Feb. 13—Route 7, Section 1, Old Mans Creek Mill Pond Hill, Reinforced Concrete Paving job, 0.81 miles, 20 feet wide with gravel shoulders, was awarded to the Benjamin Foster Company, Philadelphia, Pennsylvania, on their low bid of \$34,420.47.

Feb. 14—Route 7, Section 1, South Broad St., Storm Drain job was awarded to A. G. Thompson, of Trenton, New Jersey, on his low bid of \$17,650.00.

March 7—Route 6, Section 10, Quantico to Marlboro, Grading and Graveling job, 5.024 miles, 20 feet wide with earth shoulders, was awarded to the Masterson Construction Corporation, New York City, on their low bid of \$79,793.17.

March 6—Route 6, Section 11, Salem to Quantico, Reinforced Concrete paving job, 2.748 miles, 20 feet wide with gravel shoulders, was awarded to Joseph L. Burke, of Plainfield, New Jersey, on his low bid of \$144,531.77.

Feb. 17—Route 10, Section 1 B, Arcadian Way to Anderson Ave. in Fort Lee, Reinforced concrete paving job, 0.48 miles, 20 and 30 feet wide with earth shoulders, was awarded to the firm of John J. McGarry, Edgewater, New Jersey, on his low bid of \$40,476.64.

Feb. 21—Route 13, Section 3, Cape May Court House to Swanton, Reinforced Concrete paving job, 2.087 miles, 20 feet wide with gravel shoulders, was awarded to the firm of Sutton and Corson, Ocean City, New Jersey, on their low bid of \$118,776.16.

March 8—Route 4, Section 9, Smithville Mullica River, Warrenite Bitulithic job, on concrete base, 3.448 miles, thirty feet wide, with gravel shoulders was awarded to C. H. Earle of Hackensack, New Jersey, on his low bid of \$374,531.77.

March 8—Route 4, Section 1, Trenton West Long Branch, Sheet Asphalt job on Concrete Base, 2.60 miles, 20 feet wide with earth shoulders, was awarded to the Utility Construction Company of New Brunswick, New Jersey, on their low bid of \$49,600.04.

April 14—Route 3, Section 3, Madison Ave., Madison Township and Borough of Madison, Warrenite Bitulithic on Concrete base, 2.032 miles, 20 feet wide with earth shoulders, was awarded to the Northern Construction Company, of Newark, New Jersey, on their low bid of \$117,844.37.

April 13—Route 15, Sections 2 and 3, Bridgeton-Millville, Warrenite Bitulithic on Concrete base, 8 miles, 20 feet wide with gravel shoulders was awarded to the Tri-State Construction Company of Bridgeton, New Jersey, on their low bid of \$455,500.12.

April 14—Route 4, Section 14, Laurelton-Lakewood, 3.875 miles, Reinforced Concrete Paving job, 20 feet wide with gravel shoulders was awarded to C. H. Earle of Hackensack, New Jersey, on his low bid of \$144,705.68.

April 28—Route 4, Section 13, Richmond Ave., Point Pleasant Beach, Reinforced Concrete paving job, 0.848 miles, 20 feet wide with earth shoulders was awarded to C. H. Earle of Hackensack, New Jersey, on his low bid of \$35,471.76.

May 16—Route 4, Section 15, Lakewood (County section) 2.556 miles Reinforced Concrete Paving job, twenty-eight and thirty feet wide, was awarded to the Public Service Production Company of Newark, on their low bid of \$75,748.82.

May 16—Route 4, Section 15, Lakewood (Township Section) 2.556 miles, Reinforced concrete paving job, 36 and 50 feet wide was awarded to C. H. Earle of Hackensack, New Jersey, on his low bid of \$105,741.10.

May 23—Route 6, Section 12, East Commerce Street, Bridgeton, 1.314 miles long. Sheet Asphalt paving job on Concrete Base, 20 and 32 feet wide, was awarded to E. K. Mixner Co., on their low bid of \$80,422.01.

May 10—Route 7, Section 8, North Broad Street, 1.382 miles Reinforced Concrete paving job, 20 feet wide with earth shoulder was awarded to Ralph S. Seng, on his low bid of \$150,775.00.

May 26—Route 10, Section 1, Bridgeton-Parkman, 2.415 miles Reinforced Concrete paving job, 20 feet wide with earth shoulders was awarded to Ralph S. Seng, on his low bid of \$150,775.00.

May 26—Route 4, Section 16, Maple St., Fort R. 1.97 miles long. Reinforced Concrete paving job, 20 and 32 feet wide with gravel shoulders was awarded to the Public Service Production Company of Newark, on their low bid of \$70,874.59.

June 2—Route 4, Section 9, Barkers Corner-Hickory town, 2.09 miles Reinforced Concrete paving job, 20 and 48 feet wide with earth shoulders was awarded to Frank J. Groman, of Bethlehem, Pennsylvania, on his low bid of \$240,274.37.

June 6—Route 2, Section 4-A, Whitehorse-Crosswicks Creek, 0.180 miles, Reinforced Concrete paving job, 30 and 40 feet wide was awarded to Daniel Klockner, of Trenton, New Jersey, on his low bid of \$40,476.64.

Jan. 10—Route 6, Section 8, Pearl St., Bridgeton, Reinforced Concrete paving job, 0.455 miles, 20 and 30 feet wide with gravel shoulders was awarded to the Tri-State Construction Company, Bridgeton, New Jersey, on their low bid of \$17,650.00.

April 5—Route 4, Section 10, Shadow Lawn Rosell Avenue, Sheet Asphalt Paving job on Concrete Base, 2.41 miles, 20 and 46 feet wide with earth shoulders, was awarded to Newark Paving Company, of Newark, New Jersey, on their low bid of \$104,999.51.

April 4—Route 2, Section 3, South Broad Street, Sheet Asphalt job, on Concrete Base, 0.648 miles, 48.5 feet wide, was awarded to J. L. Barrett, Trenton, New Jersey, on his low bid of \$50,434.75.

March 11—Route 11, Section 1, Main Street, Passaic, Sheet Asphalt job, on Concrete Base, 0.257 miles, 22 feet, 2 inches wide, was awarded to Union Building Construction Company, Passaic, New Jersey, on their low bid of \$15,100.15.

April 5—Route 4, Section 12, Sea Girt Avenue, Reinforced Concrete Paving job, 0.162 miles, 20 feet wide with earth shoulders was awarded to F. H. Riddle, New Brunswick, New Jersey, on his low bid of \$8,800.00.

April 4—Route 9, Section 6, Somerville-Bound Brook, Reinforced Concrete Paving job, 2.491 miles, 20 feet wide, earth shoulders was awarded to Salmon Brothers, Netcong, New Jersey, on their low bid of \$131,710.10.

March 31—Route 4, Section 5-A, Storm Drain in Red Bank, was awarded to Chas. J. Romano, Montclair, New Jersey, on his low bid of \$15,313.85.

April 10—Route 6, Section 9, Salem-Collier's Run, Reinforced Concrete Paving job, 4.752 miles, 20 feet wide with gravel shoulders was awarded to Sampson & Reuter, Elizabeth, New Jersey, on their low bid of \$196,975.08.

April 18—Route 9, Section 5, Union Avenue, Bound Brook, Sheet Asphalt on Concrete Base, 1.501 miles, 20 feet wide with earth shoulders was awarded to the Utility Construction Company of New Brunswick, New Jersey, on their low bid of \$93,090.31.

April 10—Route 3, Section 8, Camden-Clements Bridge Road, Reinforced Concrete Paving job, 3.82 miles, 36 and 40 feet with earth shoulders was awarded to W. Penn Corson, Camden, N. J., on his low bid of \$269,644.85.

April 10, Route 3, Section 9, Clements Bridge Road-Kirkwood, Reinforced Concrete Paving job, 3.756 miles, 29 feet wide with earth shoulders was awarded to John M. Kelley Construction Co., Camden, N. J., on their low bid of \$200,592.95.

April 10—Route 3, Section 10, Kirkwood-Berlin, Reinforced Concrete Paving job, 5.576 miles, 29 feet wide with earth shoulders was awarded to John M. Kelley Construction Co., Camden, N. J., on their low bid of \$297,993.89.

May 29—Route 9, Section B, West Front Street, Plain-

field, Sheet Asphalt paving job on Concrete base, 1.20 miles, 48 and 41 feet wide, was awarded to the Union Paving Company, of Newark, New Jersey, on their low bid of \$214,070.20.

June 20—Route 1, Section 2, Trenton City Line Notting ham Way, reinforced concrete paving job, 0.628 miles, 20 feet six inches wide, was awarded to Kees and Foy, of Trenton, New Jersey, on their low bid of \$68,140.44.

June 21—Route 4, Section 3 A, Main Avenue, Red Bank, Sheet Asphalt paving job on Concrete Base, 1.00 miles, 40, 44 and 42 feet wide with earth shoulder was awarded to J. L. Barrett, of Trenton, New Jersey, on his low bid of \$57,420.13.

June 21—Route 4, Section 11, Main Street, Avon, New Jersey, Warrenite Bitulithic job, on Concrete Base, 0.273 miles, 44 feet wide with earth shoulders was awarded to the East Jersey Bridge Company, of Perth Amboy, New Jersey, on their low bid of \$49,814.14.

June 21—Route 4, Section 11, Snowden Avenue, Morrisway, Warrenite Bitulithic job, on Concrete Base, 1.126 miles, 24 feet, 2 inches wide was awarded to S. Geiger Sons of Newark, New Jersey, on their low bid of \$11,500.00.

June 21—Route 9, Section 1, Passaic, Sea Avenue, Reinforced Concrete paving job, 0.162 miles, 20 feet wide with earth shoulders was awarded to the Utility Construction Company of Newark, New Jersey, on their low bid of \$11,500.00.

## Along Your Highways

(Continued from Page 10)

of a couple of miles to Iselin, where a sharp, one mile left hand right-angle turn, and a very dangerous grade crossing existed. The highway then continued on the westerly side of the railroad at some distance away

through the town of Camden a high class residential section, then coming out at the same point in Rahway where the present improved hard surface straight highway comes out. Upon these sections of the highway from Morris Park to Rahway constructed in war times with bitulithic on a very sticky and soft soil condition was met. The need for the road to accommodate abnormal war time truck traffic was so great that construction was pushed very fast and under conditions that would ordinarily have been prohibited. The straightening of the highway and the elimination of dangerous points is noteworthy on this section.

Through Rahway a twenty-two foot concrete pavement was laid with a center line marking which has a marked tendency in directing the traffic and thereby preventing accidents.

The section of Route 1 north of Elizabeth was constructed of concrete base and Warrenite top to a width of twenty-nine feet. The greater width of Route 1 north of Rahway where Route No. 1 and Route No. 4 join, was necessitated by the increasing flow of traffic encountered during the war. The section of Routes 1 and 4, bringing about the junction of Route 1, which carries the heavy truck traffic, and Route 4, which carries the heavy passenger traffic, is a section of the highway through Rahway, New Jersey, which is a section of the reconstruction of the highway from Rahway to Newark.

The reconstruction of the highway through Rahway and Newark this year under the reimbursement act will continue with the reconstruction of the hard surfaced roadbed on the concrete pavement from Trenton to Newark.

A section of the Rahway highway, not in 1937 made highway, Route No. 1, continues through Elizabeth, Newark and Jersey City to the approach to the ferries and the vehicle tunnel, although that portion through Newark and Jersey City has not yet been taken over for maintenance by the State Highway Department.



In front of Seaview Golf Club, near Atlantic City, (Route 4)

## Warrenite—Bitulithic Pavements Have Stood Up Under Heavy Traffic For 15 Years

The test of the paving is in the riding—and the cost of upkeep. Upon either of these points we invite your critical investigation. Some of the oldest paved roads in New Jersey were laid under the Warren patents. Many of these have been in constant use under heavy traffic for fifteen years. They are still in excellent condition.

*"The Best Road You Can Buy Is the Cheapest in the End."*

**Warren Bros. Company**  
District Office 50 Church Street, New York City, N. Y.



Benson Street, Glen Ridge, New Jersey. "Tarvia-B" 1919 and 1920

## Are your roads in rags, or well dressed?

"The apparel oft proclaims the man."

And Shakespeare might well have added, "The road oft proclaims the town;" for good roads are the one unfailing sign of a progressive community.

Tarvia Roads are not only good roads—they are also *economical roads*.

Whether used for new construction or for resurfacing worn-out macadam, the moderate cost of Tarvia-macadam means a substantial saving in first cost, while the saving in maintenance expense, compared with other types of permanent construction, is proportionately even greater.

Tarvia roads are dustless and mudless in

all kinds of weather. They are waterproof and so are unaffected by the biting frosts of winter. The melting snow finds them smooth and firm—all ready for the hard summer traffic.

For your every road problem—new construction, repairs and maintenance—there is a grade of Tarvia and a Tarvia treatment that provides an economical and satisfactory solution.

Hundreds of progressive communities in every part of the country use Tarvia for all their road work. They have found that Tarvia roads "make the going easy" for both the travelling public and the taxpayer.

Tarvia is a coal tar preparation made in a number of grades to meet varying road conditions. It is the most popular road material in America and has solved the problem of low cost, traffic-proof roads and pavements for hundreds of towns throughout the country.

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that often saves the motorist. And with Concrete pavement, that fraction is available for you.

Good brakes, good tires, good driving—all are necessary, but above all there must be a skid-proof pavement.

Concrete streets are skid-proof. Tires can grip the firm, gritty surface even in wet weather. Concrete is clean, permanent, hole-proof—a pavement after the motorist's and home owner's own heart.

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## GLUTRIN

### Four Reasons Why All Gravel Roads Should Be Treated With Glutrin

First: Glutrinized gravel roads are hard all the year round.

Second: Glutrinized roads shed water—and for that reason they do not rut up during the winter and Spring.

Third: Glutrin is the best binder yet discovered for gravel stone, sand-clay, or slag or earth roads.

And finally: Glutrin is not only the best binder, but by far the most economical.

#### What Local Authorities Think of Glutrin Road Binder:

*Taken from the Daily Pioneer of Bridgeton, N. J., Tuesday, February 14, 1922*

##### "SHOWS VALUE"

"Last fall the state highway department caused west Commerce street to be flushed with glutrin, an oil-like preparation which has for its object the laying of the dust and preventing the gravel on the roads from being cut up with the traffic. The glutrin application also has had the effect of giving the street a surface which turned much of the water, and the results show a very much improved condition this winter. While most of the gravel streets are soft with mud, west Commerce street is comparatively firm and free from mud, and much smoother in consequence. The experiment would seem to indicate that the glutrin application greatly improves dirt roads."

Glutrin has been manufactured by us in our own plants for over 15 years. We have our own tank car line in which to deliver the product. The material used in New Jersey was applied by Mr. M. R. Young, Trenton, N. J., with pressure distributors especially built to handle this product.

Send us your name, and let us put you next to Glutrin!

**Robeson Process Company**  
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(Courtesy Portland Cement Association)

### When Vulcan Made 'em, They Lasted Forever

Vulcan was the blacksmith of the Gods on high Olympus.

The things he forged in his mighty smithy lasted forever.

Neither time nor tempest, age nor rust, could

destroy their everlastingness!

In that, they were similar to roads built of "Vulcanite"—the cement that is made in our giant plant at Warren Co., Pa., with its capacity of 2,000,000 tons a year.

*"Let's get together and talk Cement"*

**VULCANITE PORTLAND CEMENT CO.**

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## "EDISON"

The Word that means "Cement Satisfaction"

Why not put your cement troubles up to Edison?

Why fret and worry and lose money on slow deliveries, when we can ship your order the same day as received?

Do you realize that Edison Cement is produced right here in New Jersey; and that we can ship 150 carloads a day?

*"Edison service Cement when you want it!"*

**EDISON PORTLAND CEMENT CO.**

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PLANT: NEW VILLAGE, N. J.

## ALONG THE ROAD



A spot like this is worth travelling many miles to see. How inviting those hills look for a basket-lunch. Why not plan that little trip for next Sunday? (Route No. 7, Near Kinkora)

### ONE WAY TRAFFIC

There is only one road to the town of "Success."  
The name of the road is "Work".  
It has room for only honest guests,  
Traffic's blocked to those who shirk.

The road is open all hours of today.  
It heeds neither time nor date.  
And now is the time to start on your way,  
For tomorrow will be too late.

Nearly all of the way is an uphill road;  
It will seem like a tough old fight,  
But once on your way just bear up your load  
And keep going with all your might.

You will pass through many towns each day,  
Such as Failure, Gloom and Despair;  
At each of these stations just keep on your way,  
For "Work" does not tarry there.

Once you have entered the town of "Success",  
Tho' your load may have been hard to bear,  
Once inside you will find both comfort and rest,  
Just be thankful you started for there.

—Dale Newell Carty, in *Forbes Magazine*.

### Our Tom

Made President of American Road Builders Association

At the annual meeting of the American Road Builders Association, recently held in New York City, T. J. Wasser, State Highway Engineer of New Jersey, was elected President of the Association.

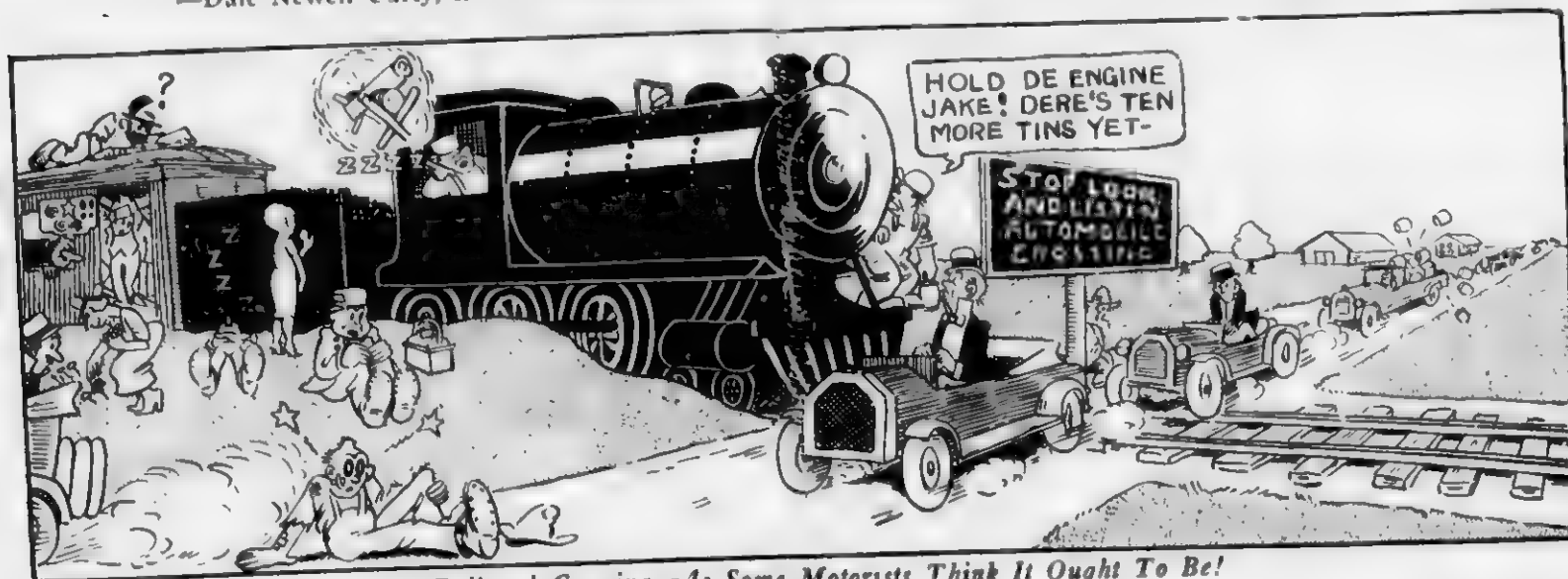
Needless to say, the entire Highway Department congratulates "T. J." on this new recognition of his abilities, and wishes him all success in his added duties.

### By-Roads

When you travel, do you stick to the foolish habit of traveling only the main highways?

Of course, if you're on business, and every half-hour counts, that may be necessary. But how often we could take a little time for the "by-roads"—and don't do it.

Next time you go out on a pleasure trip, don't try to see how many miles you can cover, but how charming a spot you can find for a few hours—or a night's camping.



The Railroad Crossing—As Some Motorists Think It Ought To Be!

# The Highwayman

Route No. 15 North of Kingston

July  
1922

Road Builders' Supplement

Vol. I  
No. 12



Route 16, between Rocky Hill and Hartman

Several of the Eastern States have large mileages of stone and macadam highways. With improved methods of maintaining and re-surfacing these roads, it has been possible to put them in such condition that, with few exceptions, they have stood up remarkably well. (See page 8)

## Are They on the Job?

When you roll along the road in your car, and after riding over miles of almost perfect pavement, strike a "bad spot" of a few rods, or an old road that has gone to pieces, it is a very simple matter to cuss out the whole Highway System, National, State and County.

But do you ever take the trouble to give fifteen minutes time to know what the men who build your roads are doing to give you better roads?

Read the first article in this Supplement, and learn something.

## Note

The papers presented at the recent Convention of the New Jersey Highway Association, and the discussions following them, are such a valuable contribution to the progress of road-building that it has been decided to publish them in full with as many as possible of the charts and illustrations used. (It has not been possible to include all of these, however, so there are occasional references in the text, to photographs and charts which have not been reproduced).

Our aim is to publish one or two of the Convention papers, with the discussion thereon, each month. We suggest that these be carefully filed, so that the reader may keep the complete set, which will make a very valuable addition to his road-building library.

This month we are printing "Improvements Made During 1921 in the Construction of Concrete Pavements", by L. N. Whitcraft, Portland Cement Association; and the discussion thereon at the convention; also "Maintenance of Macadam Roads", by W. A. Van Duzer, Assistant Maintenance Engineer, Pennsylvania State Highway Department; and the discussion thereon at the convention. Next month there will be published "Merits of Bar Reinforcement for Concrete Pavements", by W. S. Edge, Concrete Steel Company and the discussion thereon at the convention; also "The Proper Weight and Methods to Use to Secure the Desired Results with Sheet Fabric Reinforcement for Concrete Pavements", by W. C. Kuhn, American Steel and Wire Co., and the discussion thereon at the convention.



# The Highwayman of New Jersey

## Improvements Made During 1921 in the Construction of Concrete Roads

By L. N. Whitcraft, Field Engineer Portland Cement Association

During the past season those of you who were engaged in the construction of concrete highways found that your specifications and construction details were radically different from those in general use prior thereto. In brief the more important of these changes and their general functions are as follows:

**Center Longitudinal Joint.** This feature divides the entire pavement slab longitudinally and permits of pouring the full slab width in one operation. The division of the pavement longitudinally increases its beam strength about four times and further precludes the possibility of longitudinal cracks.

**Doweling of Transverse Joints.** The use of dowels add additional reinforcement at the joints and hold the adjoining slabs in the same relative position. Dowels should be especially effective at the corners of the slab which are naturally weaker than adjoining sections.

**Inclusion of Heavy Mesh and Bar Reinforcement—In either Single or Double Layers.** The advantages of the heavier steel reinforcement, within reasonable limits, should be obvious for the reason that it gives the pavement greater structural strength and greater resistance to sub-grade changes. To more successfully resist both factors it is used, when deemed desirable, in both top and bottom of the slab and in either mesh or bar design.

**Laying of a Uniform Thickness of Slab.** The weakest point of support of a pavement is at the sides which are usually left unprotected and are subjected to as great a load as is any part of the pavement. It is to secure greater strength, or the same strength at the sides as at the center that a uniform thickness of slab is designed.

**Handling of Aggregates Direct to the Mixer Without Same Being Placed on the Sub-Grade.** This requirement, of necessity, leads to the central proportioning and loading plant and permits of and facilitates an accurate centralized control of all aggregates direct to the mixer from the unloading plant. The keeping of the sub-grade free and clear from material stock piles permits of more accurate workmanship in the preparation thereof so that with no subsequent obstructions or disturbance the sub-grade should be found both true to grade and cross-section at the time of placing concrete.

At first thought these changes in design gave one the impression that we are getting beyond reasonable economic limits. Such, however, has not proved to be the case. On the other hand each and every feature has apparently well performed the function for which it was designed and without unduly increasing the cost of these highways. Credit for this is justly due both the construction forces and the contractors who so willingly cooperated in an honest endeavor to secure the best possible results under the conditions imposed.

The construction of the center longitudinal joint and the finishing of the groove directly over same has been greatly simplified and perfected by the placing temporarily, of a 2 inch metal cap upon the  $\frac{1}{8}$  inch dividing sheet. This cap consists of two  $\frac{1}{8}$  in. x 2 in. strips of iron and one 1 in. x  $\frac{1}{8}$  in. strip of 8 ft. to 10 ft. lengths riveted together with the 1 in. strip between the two 2 in. strips. With the metal dividing sheet placed upon the sub-grade and coming within 1 in. of the finished surface the placing of this cap upon same brings its top surface to finished grade. When properly staked this permits the placing of concrete and finishing over the full width of pavement. In addition thereto the metal cap so placed gives sufficient rigidity to insure the dividing sheet remaining in a true line and perpendicular to the sub-grade.

After final finishing of surface is accomplished and the concrete becomes sufficiently stiff to hold its shape the metal cap is removed. The edges of the groove so formed are then rounded with an edging tool of  $\frac{1}{4}$  in. radius

and the groove is ready for pouring with tar or asphalt at any time after the concrete hardens and before the pavement is opened to traffic. Care should be taken, however, not to obtain a groove of greater than 1 in. opening across the top, the reasons for which are obvious.

Doweling of transverse joints by the installation of iron rods is an easily accomplished construction feature. Nevertheless it should be carefully done in order that these rods shall be parallel to both the finished surface and the axis of the pavement. It is also very essential that one-half of the length of each rod is so protected by wrapping that there is no bond with the concrete. Also that a space for longitudinal slab movement is provided at the end thereof. Failure to properly provide for these features may cause a serious rupture or spalling.

With respect to the use of the new designs in reinforcement far better construction results are to be had in the use of the bar or heavy mesh reinforcement than with the lighter types of mesh. This is due principally to the greater rigidity of the heavier reinforcement and the recently designed methods for accurately supporting same in place by the use of pipes laid upon the sub-grade. Where the double layer of reinforcement is used the accurate spacing apart of the mats is simplified by the use of "chairs" which are fabricated with the mats. Better yet, this can be accomplished by the inclusion of deformed or bent members in the makeup which serve as "spacers" and have a definite reinforcing value as well. These methods of supporting and spacing apart of the double layer or fabricated mats have one great advantage in that this so-called "cage" of completely fabricated double layer reinforcement permits of pouring the concrete in a single full course depth. This is also a distinct advantage over the old practice of placing a course of concrete then a layer of reinforcement followed by another course of concrete, especially when dry concrete is used.

Uniform thickness of slab requires no different construction than the pavements of greater thickness at the center than at the sides, other than in the former sub-grade is shaped to the specified crown, which is usually 2 in. or less, while in the latter the sub-grade is flat. The impression prevails that the crowned sub-grade is preferable to the flat one principally because of the fact that it drains off and dries out more rapidly after a rain. This is a desirable feature in connection with progress and the preservation of good sub-grade conditions.

No one feature in the construction of concrete highways has been productive of more highly desirable results in character of workmanship and quality of these highways than that of keeping the aggregates off the sub-grade. As a result we now find anywhere from one to twenty batch units being delivered to the mixer all proportioned accurately alike which makes for greater uniformity of concrete. The properly prepared sub-grade, at all times unobstructed, should insure the required thickness of pavement at all points. With this requirement in effect one can readily tell whether or not the specified thickness of pavement is being placed. Another feature is the facility with which the sub-grade can be restored to its proper condition in case of disturbance by rains or other causes, such as the development of weak spots due to unsuitable sub-grade material which it may be necessary to remove.

While these features, above mentioned, have undoubtedly brought about a very noticeable improvement in the construction of concrete pavements, and will add very materially to their life, there still remains room for further improvement to which I desire to call your attention.

The thought prevails generally that heavily reinforced concrete pavements do not crack, and it has been with a view to eliminate cracks that the reinforcement feature has been given so much consideration. Admitting that



Illustration of concrete pump in operation on road. Route 1, Sec. 3-A, 1. Concrete pump discharging into the mixer and building crew.

it is not done with a great measure of success, we must not lose sight of the fact that the results are not as good as they should be.

It is generally accepted theory that cracks are due to too rapid changes in temperature and unequal bearing power of the sub-grade. Yet if these were the only causes the designs of reinforcement would serve to more nearly eliminate them.

Study of the methods of construction of these pavements has led me to believe that the most successful and effective method of eliminating cracking is the use of the reinforcement together with the proper protection and curing of the concrete during the early hardening period. It is during this hardening period, when the concrete has become too tough to resist shrinkage, that transverse or shrinkage cracks occur. It is also during this period that the reinforcement is of little or no value, for there is no bond until the concrete hardens.

To offset this shrinkage, sometimes called contraction, during the period between the time the concrete is placed and the time it sets, and has strength, it is absolutely essential that effective curing be had immediately following the time of final finishing of the surface in order that this cracking might be eliminated. The development of this cracking as a result of too rapid drying out and ineffective curing is far more apparent in long length slabs

than in the shorter ones. It would therefore seem that the slab lengths should be greatly dependent upon the effectiveness of the curing to be done.

Another advantage to be gained as a result of effective curing is that concrete properly cured by being covered and kept constantly moist as provided for in your standard specifications will show much more compressive strength and much less wear than that which has been allowed to dry out too rapidly. It is true that any and all factors that tend to produce strength in concrete also tend to increase its wearing qualities. As an illustration of this, at the end of 4 months the compressive strength of a concrete of a given consistency was about 1700 pounds per sq. in. when it was allowed to dry out in the air unprotected, while exactly the same concrete stored in damp sand for the first 21 days gave compressive strength of about 4000 pounds per sq. in. and a correspondingly less wear in the rattler tests. In short, proper protection and curing for a period of 10 days means an increase in strength and resistance to wear of approximately 100 per cent.

With knowledge of this kind as to the possible increase in strength and resistance to wear to be had through so simple a method as effective curing for so short a period as ten days, why should we throw away one-half of the life of concrete highways by failing to observe this rule.

## Discussion on Improvements Made During 1921 in the Construction of Concrete Pavements

By J. A. Williams, Southern Division Engineer, New Jersey State Highway Dept.

MR. WILLIAMS: Mr. Chairman and Gentlemen. I have listened with much interest to the paper of Mr. Whitcraft, and will say that within the last month I have spent most of my time listening to a series of lectures on Highways at the University of Pennsylvania. This course at the University was based mostly on the practices of the State of Pennsylvania. When we enrolled for this course we were instructed to buy a book written by a man by the name of Agg from Iowa. Most of us that got the book read it over the first night and heartily disagreed with it. We went back to the University and listened to lectures by the Chemical Engineer of the Pennsylvania State Highway Department, the Engineer of Construction, and the Engineer of Maintenance, and found, to our surprise, that they also disagreed with that book. We men from New Jersey that listened to their lectures came to the conclusion that we disagreed with what the Pennsylvania men told us. Mr. Whitcraft's paper outlined what is practically the policy set last year by the New Jersey State Highway Department. In fact I am sort of in the stage of what a

lawyer friend of mine told me about a jury. The jury was called in the morning. The prosecuting attorney gave his story, called his witnesses and the case adjourned for dinner. In the afternoon the attorney for the defense stated his case and called his witnesses. The jury discussed it among themselves and the Foreman of the jury got up and said: "Your Honor, is it necessary for us to listen to any more testimony? Before dinner I had a very good idea of how this case stood and I think the rest of the jurymen were in about the same state of mind. Since dinner the testimony has been more or less conflicting. If you would call the case to an end right now, we could retire and give a quick intelligent verdict, while if we wait to hear any more testimony, I doubt if we ever reach a conclusion." I don't mean by that that we should not listen to Mr. Whitcraft's paper or to the lectures of the men from Pennsylvania, or that we should not agree with Mr. Agg's book. I understand that Mr. Agg had considerable to do with the making of the good roads in Iowa. I know there are good roads in Pennsylvania. I

# The Highwayman of New Jersey

5

also know that there are good roads in New Jersey. I, therefore, believe that the greatest thing in getting good roads is to set a policy, and stick to that policy. I think there are very few things, no matter what they are, but what there is more than one way of doing them. That is brought out by the placing of reinforcements in pavements.

Pennsylvania uses a slab with a flat bottom about 9 in. center of thickness and 6 in. side thickness, similar to what we used a few years ago. They place expansion joints at all breaks in the grade but not less than 200 feet apart, and place reinforcing in the top of the slab. New Jersey, a few years ago, used no reinforcing. Good roads were built that way.

At the present time our policy is practically as outlined by the paper of Mr. Whitcraft. I believe, gentlemen, as most of you are interested in work in New Jersey that you should carefully look over the specifications of New Jersey. At first reading there will be many things with which you will disagree. At the second reading, you will find most of these things are just as you thought they should be in most instances, and that there are some other things that you can't agree with.

I believe our best interest is to get good roads in this State. If we believe that the policy as set by our State Highway Department and by the Counties in their work is the proper policy to follow and follow it right through, we will get good roads. However, if on the other hand, you are a contractor and when you bid on a job you look over the plans, specifications, etc., and say, "Well, that is a hell of a set of plans and specifications, I can't think of anything good to say about them, however, I need the money, let's go to it," you will throw the plans and specifications in the corner somewhere and go on the job. Perhaps the equipment you take is suitable, perhaps it isn't. However, that is your equipment, and you are going to use it. I think that is the wrong attitude entirely. You should carefully read over the plans and specifications and see if you can make yourself agree with what they outline, and if you don't agree, see if you can't do it anyway.

On the part of the inspector, you should very carefully study the plans and specifications and consider first that the man who wrote the specifications and made the plans probably knew a little bit of what he was talking about or what he put on the plans. Some of us on the road often wonder how the fellow who made the plans holds down his job. Possibly on the other hand, he should wonder how we hold down ours, and if we used a little more self-analysis instead of quarrelling with the other fellow, the results might be a little better.

In this matter of agreeing with the plans and specifications, last summer I heard a couple of engineers talking about a couple of jobs built within the last three years in the State of New Jersey. These jobs were what you might call identical jobs. They were in the same county, abutted on each other and the specifications were exactly the same. The plans were supposed to fit the locality. One job was a pleasure to be connected with. Everything seemed to run smoothly. The job was finished nearly on time. The other job was sort of a battle royal all the way through. The contractor would not agree with anybody and would buy almost anything that anybody was willing to sell to him. He could not see why anything should not go into the road. Sand is sand, stone is stone, and cement is cement. Whether it was mixed with sand, clay or loam, it did not seem to bother him much. The same material that he was using was going into the Ritz-Carlton Hotel and we all know what that is.

It was good enough for that, it must be good enough for the road. On the other hand, the other fellow seemed to want to get along, and anything you suggested he seemed willing to do. I understand the man who was willing made money. At least he says he did not lose any. (I never yet heard of a contractor who made money). The other man says he lost money and I think he did. If he had tried to enter into the spirit of the game a little more, he might have broken even. The one job has cracked, and never did have the appearance of a good one, while the job that did make money for the contractor is a very fair job today.

The conclusion is that the first man who made money mixed a little brains with his concrete.

I do not know what the other man mixed with his concrete. I think he came as near the specifications as we could force him to. However, most of the specifications are sadly lacking in the requirements for brains. By that I do not mean to say on the part of the men making the specifications, but in requiring the people who use the specifications to have brains. You can get for good materials and good workmanship, but if you do not have brains in the work you have my sympathy. I don't believe you will have good results. It's something like the story of Mrs. Newlywed who said to the grocer, "You sent some flour yesterday that was awful tough. I made a pie with it and you couldn't pull the crust apart." There is no question but what someone else got some of the same flour and made a good pie with it and called it nice, tender flour.

I will say, in closing, gentlemen, that the main thing to be considered in all of this work is the fact that first, if we want good road, we should outline a policy and stick to it. If your policy is wrong, the policy can be changed next season, but you should not, every time you come on the job, try to tear it apart and have the engineer make a new set of plans. If the inspector thinks it is wrong, he should try to have it done the way it was designed to be done, and try to believe that the fellow who outlined the thing in the first place probably knew a little bit about it.

In starting this discourse I mentioned Iowa, Pennsylvania and New Jersey. All have good roads, and all have a policy. I believe their policies are all different except for the one fundamental fact, that they want good roads. Iowa is getting it through its policy, Pennsylvania through their policy, and we have been getting it from ours. I believe, gentlemen, that the thing to do is to study your plans and your policy and try to enter into the spirit of the thing and then you will be surprised at the results. I thank you.

COL. WHITEMORE: I would like to call your attention to the fact that this discussion is on concrete pavements, and I would ask that you confine your questions and remarks to that subject. The time is limited and important papers are to come before you.

I would like to make this comment, with which you are doubtless familiar, but which we sometimes lose sight of, that in the process of making concrete with cement, sand, and stone, you speak sometimes of the material drying up. That is, subjecting the material to influences that are absolutely detrimental. The setting of cement is a chemical process, and the more you can completely exclude the air the better the results. For a great many generations we have been familiar with lime mortar, which depended upon contact with air for setting qualities. We do know that a lime cement in contact with air, hardens quickly and loses strength. You can break some walls from 20 to 24 in. thick that have been standing 15 or 20 years, and you will find that the air has been so completely excluded from the heart of wall that the mortar is still soft since the carbonic acid of the air has been completely excluded. In cement work, if water or other substances are used to exclude the air, the better that product will be for you to have it set with the air completely excluded. In some places where the roads are comparatively level, they build dams around the road and flood it with water. You should keep very clearly in mind that the more you exclude the air from the concrete the better the results are going to be.

MR. ROBBINS: Mr. Whitcraft spoke of an effective slab length. What did he mean by that?

MR. WHITCRAFT: I do not just understand the question.

MR. ROBBINS: Did you not speak of an effective slab length?

MR. WHITCRAFT: The point made is this, that the length of the slab should be dependent upon the amount or effectiveness of the curing that is to be done. I cannot say build a continuous slab length of 200 feet and not have a crack develop in it. You may go out and lay a 200 ft. length slab and leave it unprotected. This has been tried out repeatedly without producing a crack, sometimes it will produce two or three. On the other hand, I believe you can successfully lay the longer length slabs without these cracks if you can follow up the final finishing of the slab by covering it and keeping it damp and moist. The



This shows you how one slab is joined to the next. (Route 4, Sec. 3-1). The bars sticking out of the concrete are wrapped with tar paper. This allows the next slab to expand and contract without cracking, but prevents it from raising above or settling below the first slab.

one should be dependent upon the other. I have in mind a particular point that was raised in connection with two slabs in one of your last year's State Highway contracts. I had my attention called to the condition of these slabs in this job. They had several cracks and the road had not even been opened to traffic. It was thought that there should be a change in the specifications by the Highway Commission. I asked what length these slabs were. The men did not recall. I said they were about 600 feet in length. He said no. As a matter of fact they were. In one particular slab 600 feet long there were from 18 to 20 transverse cracks approximately 10 to 12 feet apart. This slab showed these cracks before traffic during the summer season. There were no extreme changes in temperature, so you cannot say that the slab cracked up from traffic or sub-grade temperature changes, but these cracks simply developed by too rapid drying up of that long length of slab. They were contraction cracks. I feel, on the other hand, that while probably the extreme length of slab is bad practice to construct, if you want to eliminate it, I believe it could have been constructed without cracking if covered up to prevent drying out following the final finishing up.

MR. ROBBINS: I will change the question. Under ideal curing conditions what would you consider a minimum slab length? Does the slab length bear any relation to its width? What is the proper proportion of width and length?

MR. WHITCRAFT: I do not know, and I do not think anyone else does. I can't tell you on that basis, but go back to the other statements. I believe in designing these slab lengths, we should take into consideration the length of the slab you design and how well you are going to cure it. I do not think it is fair to the public that they should pay for these roads or the material going into the roads, if we are going to let so simple a feature of construction as curing—so cheap a feature—be neglected and the road allowed to develop these cracks, which we do not want in the roads. I think that one of the main reasons that more effective curing is not done is that it is evidently such a trifling matter. A contractor thinks he can take care of it at the end of the day and has not got time to cover it up and sprinkle it. We have never attached enough importance to this one feature, and it can be shown by tests that concrete develops 100% more strength by the curing methods described today in your specifications, and I believe it is just as essential to properly cover it and cure it for ten days as it is to put cement in it.

MR. ROBBINS: Yes. Has your Association ever made serious investigations to determine the proper proportion between the length and width of the slab?

MR. WHITCRAFT: I believe not. I cannot think of any way you could dope out the proper slab length by showing any relation between the length and width of it. It might be that you can.

MR. ROBBINS: It seems that there should be such a thing in a rational design.

MR. WHITCRAFT: That is more or less an arbitrary design. Your specifications calls for a slab length of not less than 50 feet nor more than 85 feet. I think that is a

very reasonable distance, but even with the 50 to 85 feet slabs, if you don't cure them right, you will develop contraction cracks.

MR. ROBBINS: The cracks are due entirely to curing?

MR. WHITCRAFT: 95% of these transverse cracks are due to too rapid drying out. The same thing occurs with clay. When the water drains off, it will very shortly crack up. That is nothing but shrinkage.

MR. ROBBINS: In your paper I note you made reference to reinforcing and not curing as being the proper solution for cracking. Would you hold that true as a guard against cracking as against uniform sub-grade conditions?

MR. WHITCRAFT: I think sub-grade conditions eventually have an effect on the stability of your slab. We all know that changes in sub-grade, due to moisture content and frost action, will very frequently crack a slab. I believe that is to be overcome in the use of the proper amount of reinforcing. I do not believe that we can altogether overcome it, however, but we do know that the reinforcing value lies in the prevention of a great number of cracks and it further prevents cracks from opening up and holds the slab at the crack the same as dowels at the joint.

MR. ROBBINS: We are assuming a great many factors. We have to assume arbitrarily the length, the thickness, and width, and I would say that in the design these three factors should bear some relation to one another outside of arbitrary selection. Do you know of any attempt of your Association to determine any relation between the three?

MR. WHITCRAFT: That is practically the same question as the other. I do not believe there is. You say the width is established arbitrarily. Pavement widths are certainly based on something we know a whole lot about.

MR. ROBBINS: Then we divide this in two by a center joint. Therefore, again making an arbitrary width of slab. If you want an 18 ft. road, and cut it in two you have a 9-foot slab. Would you, therefore, if we were making a 27-foot road, make three slabs of 9 feet each?

MR. WHITCRAFT: No.

MR. ROBBINS: Why?

MR. WHITCRAFT: No reason particularly.

MR. ROBBINS: Why isn't it reasonable to divide a 27-foot slab into three parts?

MR. WHITCRAFT: What is the advantage? The reason is an 18-foot pavement is divided in half by reason of the center longitudinal joint. There are several. One of the principal reasons is the fact that when you have a 20-foot width of road, by dividing that slab in half you increase the transverse beam strength about 4 times, and preclude the possibility of longitudinal cracking by the reason that you build your crack in a straight line down the center of the road. These are the essential reasons and I think they are well justified.

MR. ROBBINS: What is the percentage of longitudinal cracks?

MR. WHITCRAFT: That varies. I have seen quite a few in old roads. They are very unsightly and very undesirable. I think there is another point in favor of the center longitudinal joint, and that is its effect on traffic. It is



# The Highwayman

well justified in that respect if for no other advantage. It makes safer driving. If you have any arguments against it, what are they?

Mr. ROBBINS: I was just wondering why, if just for some psychological reason, as you mentioned, that we create a condition every 100% of the distance when it does not occur from my observation over at least 10% of the distance.

Mr. WHITCRAFT: I won't dispute your figures in that respect.

Mr. ROBBINS: I can see your reason for increasing the beam strength, and then there is the factor of depth which we choose arbitrarily. Thank you.

Mr. BRAGG: The matter of curing concrete is such an important one not only from the effect of stopping the cracks, but the quality of the concrete secured all the way through that I wish to endorse what Mr. Whitcraft has said about improving the quality of the concrete by curing. I think that if we have a weak point in our construction anywhere this may be one of them, and there isn't any question whatever of the benefit to be received by careful curing of the concrete surface. The only reservation I would make on Mr. Whitcraft's statement is, whether the slab is 150, 200 or 2 feet long, I would use the best method of curing that we possibly can use. It is not alone to prevent surface cracking, but it is to add also strength, and therefore, add to the wearing qualities of the pavement.

Mr. ROSELLE: I have got something on my chest which I have just got to get off. To my mind there are three things which go to make up a road—a good road. Money, intelligent theoretical application, and intelligent practical application. I was glad to be able to listen to Mr. Williams on his discourse. He brought out the point that to produce roads we must outline a policy. That is true. We have a policy. I am glad to listen to Mr. Whitcraft because he brought out one of the vital factors commented on by Mr. Bragg, and that is the curing. I am prone to believe that too much stress is laid on the first two factors. Money—we are trying to get it here. We must have it before we can have the roads. We are laying a lot of stress on theoretical application. We are, right now at this moment. I am not sure that we lay stress on practical application, and Mr. Whitcraft's talk about curing brings out that point. You can write in your specifications and plans the policy of the use of theoretical application, but you have never seen a bricklayer that can paint a picture. Very few of them, at least. You can't take a man out of the foundry, who has never done concrete work, put him out on the road and expect him to get the cooperation and respect of a contractor on a concrete road, and I would like to ask Mr. Whitcraft if he does not believe that practical application isn't sadly being neglected in all states, leaving Jersey out.

Mr. WHITCRAFT: I would answer that by saying that you pay the contractor for practical application.

Mr. ROSELLE: As brought out by Mr. Williams, the contractor is on a different side of the fence in the game for good roads. The State Highway Department is the one mainly interested in good roads. I do not make that a specific application. There are contractors and contractors. A contractor, should, of course, if he is advertising his business, turn out a good road, but lots of times he isn't advertising his business, but filling his pockets; that is the game he is in.

Mr. WHITCRAFT: I do not agree with you. We are all filling our pocketbooks. When you say the contractor is not in it for good roads but the Highway Department is, I disagree with you altogether on that point. The contractor is in the road building business, and is just as much interested in good highways as your Highway Department or any other Highway Department is. Once in a great while there is an exception. I see them more quickly than any of you do, but I understand that 90% of the present contractors busy in building roads in Jersey today are just as much interested as you are. Why not? A contractor's business is his livelihood and life's work. I believe that ultimately good results in highway construction are to be had more through successful cooperation between the Department employees and contractors and material interests than in any other way, and as Mr. Wil-

liams says, unless you have intelligent cooperation you can't produce results. We must all get together on common ground, work with the same object, and it can be better obtained through successful cooperation. 99% of the contractors are willing to give it to you. From my observation during last year's construction throughout the entire State of New Jersey, the one thing that impressed me most was the wonderful spirit of cooperation on the part of the contractors with the Highway Department and vice versa, and I think it shows good results. There is nothing I want to see more than the feeling of fellowship among the interests concerned, but do not get the idea that the contractor is not interested in highway work.

COL. WHITEMORE: We are wandering considerably. The subject is not integrity of contractors, but as you brought it up I might make a few remarks. I think, with out fear of contradiction, that I have had more experience with contractors than anyone in the room, since '79 as engineer in charge of all kinds of work, building railroads, sewers, municipal improvements, immense steamship terminals, bridges, and some of the largest water-works in the country, and I have never yet found a contractor who was engaged in any other method of doing work than to do a good job in accordance with the contract, the specifications, and the direction of the engineer. There are men before me this morning who were working for me on contracts 31 years ago and making money with excavation at 27c a yard, so I think it is a libel against the good name of these contractors for anyone to voice any sentiment to the effect that they are there to beat the specifications. I do not think it is a fact, and I wish to voice my protest personally against such an insinuation. There is a great deal of difficulty due to a great many things not referred to. The policy so called is not in the specifications. Those are distinct requirements controlled by those in charge of the administering of the money. The specifications are made in accordance with experience and conditions prevailing. With reference to concrete pavements, if you will always remember that in the setting of cement in order to develop its strength, it is absolutely necessary to have moisture present and if this moisture be taken out of the mixture, its strength will be lowered, because it does not have a sufficient amount to develop its strength, you will eliminate many of your troubles. With reference to the question of width of slab, and as to why the center joint is made, I won't undertake to say why they are made, but I do say this, that I believe I was the first one, after being appointed on the Commission, to call attention to the fact that the center of our old highways were where everybody travelled and comparatively narrow tracked. Everyone travelled in the middle of the road. The roads with high crowns got rid of the water but it was awkward to travel on the side. We began to build improved roads and make them wider. The sides are not as hard as the middle and there is a tendency for the sides to settle and the middle not to settle, which causes a crack. If we put a joint there, we get a crack and make it straight. Under the effect of light or shade, heat and cold the concrete is rising and falling, so that it at times is absolutely free from the sub-grade and if there is a joint in the center it acts as a hinge, and if kept filled with pitch or bitumen, it will keep the water out.

With reference to the length it is not a question of arbitrary policy or guess work, but you will note that the ratio of expansion of concrete within the practical limits is about the same as steel, 7 millionths of its length for each degree of temperature, that is about  $\frac{3}{4}$  in. in a hundred feet. Your concrete is going to expand with the heat and contract with lowering temperatures, but not to the extent indicated by the change in temperature. The amount of expansion you have to provide against in concrete is not as great as is indicated by the temperature, because in contact with the ground a great deal of heat is absorbed. An example of this is the making of continuous track by welding the rail joints of trolley tracks. About 25 years ago an experimental track one-half mile in length was laid with dirt brought up to the level of the top of the rail. It was subjected to the extreme changes in varying temperatures of summer and winter. There was absolutely no change in any portion of that track of 7 in. rail. The expansion and contraction was not greater than the elastic resistance of the rail. The

## MONTHLY BULLETIN OF DETOURS

Adopted by the New Jersey State Highway Commission

Corrected to July 10, 1922

All detours posted with signs and blazed with "Arrows"

Note:—The traveler will find poles banded along each route of the State Highway System to correspond to the colors indicating the direction of the routes.

Blue on the posts or signs indicates that the road is running North and South.  
Red shows that it lies East and West.  
White Yellow tells you that it takes a diagonal course Northwest and Southeast.  
Brown indicates that it takes a Diagonal course Northeast and Southwest.

### ROUTE NO. 1—Westfield Avenue, City of Elizabeth.

Under construction. Traffic will detour as follows:  
EAST BOUND, follow Cherry Street to Orchard Street, to Prince Street, to North Broad Street.

WEST BOUND, on Prince Street from Broad Street to Orchard Street, to Cherry Street, to Route No. 1.

### ROUTE NO. 1, Section 6—Greenwood Avenue near the City of Trenton.

Under construction. Traffic will detour beginning near the City Line of Trenton at the intersection of Greenwood and Olden Avenues, thence northerly over Olden Avenue to East State Street thence easterly on East State Street to Nottingham Way, thence southeasterly on Nottingham Way to Greenwood Avenue and Bromley Inn.

### ROUTE NO. 2, Section 3—South Broad Street, Trenton.

Under construction. No detour necessary. Traffic will go through construction.

### ROUTE NO. 2, Section 3-A—Under construction between White Horse and Crosswicks.

No detour necessary. Traffic will go through construction.

### ROUTE NO. 3, Sections 8, 9 and 10—Under construction between Camden and Berlin.

Traffic to the Shore from Market Street Ferry, Camden, will go out Federal Street to Haddon Avenue to Mt. Ephraim Avenue, thence over Mt. Ephraim Avenue through Mt. Ephraim, Chews Landing, Blackwood and Clementon to Berlin.  
Traffic from the Shore will leave the White Horse Pike at Berlin going through Gibbsboro, Haddonfield, Ellensburg and over the Marlton Pike to Federal Street, Camden, thence over Federal Street to the Market Street Ferry.

### ROUTE NO. 4, Section 5-A—Maple Avenue, Red Bank.

Under construction. Detour beginning at Maple Avenue and Front Street, thence over Front Street to Broad Street to Bergen Place and Route No. 4.

### ROUTE NO. 4, Sections 6 and 10—Under construction between the Eatontown-Long Branch Road and Astenhurst.

Detour at Eatontown over South Street, thence over road leading to West Long Branch to Whale Pond Road, thence along same to Poplar Avenue, thence along Poplar Avenue to Locust Avenue, Oakhurst, thence along Locust Avenue to Roseld Avenue, Deal, thence along Roseld Avenue to Richmond Avenue, thence on Richmond Avenue to Darlington Road, thence on Darlington Road to Norwood Avenue, and Route No. 4.

### ROUTE NO. 4, Section 11, Avon-by-the-sea, under construction.

No detour necessary. Traffic will go through construction.

### ROUTE NO. 4, Section 13—Point Pleasant Beach, under construction.

Detour beginning on Route No. 4 at the intersection of Richmond Avenue and River Avenue just south of the Manasquan River Bridge, thence southerly over River Avenue to Arnold Avenue, thence westerly and southerly over Arnold Avenue to Pine Bluff Avenue, thence westerly over Pine Bluff Avenue to Osborne Avenue, thence southerly on Osborne Avenue to Route No. 4 in West Point Pleasant.  
Detour on account of construction of bridge at Inland Waterway, West Point Pleasant, for local traffic, beginning at the intersection of Route No. 4 and Arnold Avenue, West Point Pleasant, and running thence northerly on Arnold Avenue to Pine Bluff Avenue, thence westerly over Pine Bluff Avenue to Osborne Avenue, thence southerly over Osborne Avenue to Route No. 4 in West Point Pleasant.

### ROUTE NO. 4, Section 14—Under construction between Laurelton and Lakewood.

Detour beginning at intersection of Route No. 4 and Cedar Bridge Road at Laurelton or Burrsville, thence southerly through Cedar Bridge and Silverton to Hooper Avenue, Toms River, thence westerly over Hooper Avenue to Washington Street, thence westerly over Washington Street to Robbins Street, thence southerly over Robbins Street to Water Street, thence westerly over Water Street to Route No. 4, Toms River.

### ROUTE NO. 4, Section 15—Lakewood, under construction.

Detour beginning at Route No. 4 on River Avenue and Central Avenue, thence westerly over Central Avenue and the Lakewood-New Egypt Road to Cross Street, thence southeasterly over Cross Street to the Lakewood-Toms River Road or Route No. 4.

### ROUTE NO. 4, Section 16—Toms River, under construction.

Detour beginning at the intersection of Route No. 4 and Maple Street, Toms River, thence easterly over Maple Street to the old Toms River Road, thence southerly over the same to Chestnut Street, thence easterly to the Laurelton-Toms River detour thence southerly to Toms River.

Over

**ROUTE NO. 4, Section 17—Barnegat, under construction.**  
No detour necessary. Traffic will go through construction.

**ROUTE NO. 4, Section 18—Tuckerton, under construction.**  
No detour necessary. Traffic will go through construction.

**ROUTE NO. 5, Section 5—Convent Station to Madison.**  
Detour beginning at the corner of South Street and Madison Avenue, Morristown, and running from thence on South Street in a southerly direction to the Morristown-Green Village Road; from thence still southerly on the Morristown-Green Village Road to Loantaka Way; thence easterly on Loantaka Way to Woodlawn Road; thence still easterly on Woodlawn Road to the Madison-Green Village Road; thence northeasterly on the Madison-Green Village Road to Kings Road; thence southeasterly on Kings Road to Waverly Place; thence easterly on Waverly Place to Route No. 5 in Madison.

**ROUTE NO. 5, Section 9—Under construction between Barker's Corner to Hackettstown.**  
Detour beginning on Route No. 5 known as Mill Street, Hackettstown, at the intersection with Water Street, thence over Water Street to Mountain Avenue, thence northerly on Mountain Avenue to Little Street, thence westerly on Little Street to Washington Street, thence northerly on Washington Street to Moore Street, thence easterly on Moore Street to Main Street and Route No. 5.

**ROUTE NO. 6, Section 14, Broad Street, Woodbury.**  
Under construction from railroad crossing at north end of town to Red Bank Avenue. Detour north end from Westville on Westville-Glassboro Road to Cooper Street to Broad Street, Woodbury.

**ROUTE NO. 6—Manuta Avenue, Woodbury.**  
Under construction from Broad Street south to present improvement. Detour at Broad Street and Barber Avenue, thence on Barber Avenue to Woodbury-Glassboro Road to Woodbury Heights, thence to Mantua and Route No. 6.

**ROUTE NO. 6, Sections 5 and 6—Under construction between Mullica Hill and Shirley.**  
Detour via Woodstown, Alloway and Aldine to Bridgeton.

**ROUTE NO. 6, Section 9—Under construction between a point south of Woodstown (Cullier's Run) and Salem.**  
Detour beginning at a point south of Woodstown to Sharptown and Salem. Traffic will be maintained over a portion of the highway under construction from a point 1½ miles north of Salem to Salem.

**ROUTE NO. 6, Sections 10 and 11—Under construction between Salem, Quinton and Bridgeton.**  
Detour from Salem through Hagerville, Hancock's Bridge, Harmersville, Canton, Gum Tree Corner and Roadstown to Bridgeton.

**ROUTE NO. 9, Section B—Plainfield, under construction.**  
Detour beginning at Route No. 9 or Plainfield Avenue and go over Muhlenberg Place to West Second Street, thence over West Second Street to Clinton Avenue, thence over Clinton Avenue to West Front Street or Route No. 9. Traffic will be maintained on West Front Street from Clinton Avenue to the Borough of Dunellen one-half the width at a time.

**ROUTE NO. 9, Sections 5 and 6—Under construction in the Borough of Bound Brook and between Bound Brook and Somerville.**  
Detour beginning on Route No. 9 at the concrete arch bridge approaching Raritan Avenue near the easterly Borough Line of Bound Brook, thence southwesterly over the concrete arch bridge by way of Raritan Avenue and westerly over Main Street, Bound Brook, to Shunpike Avenue; thence following Shunpike and Talmadge Avenues through Bound Brook, and westerly over the New Brunswick Turnpike and East Main Street to Somerville to Route No. 9 at Gaston Avenue.

**ROUTE NO. 9, Section 8—Under construction between Somerville and North Branch.**  
No detour necessary. Traffic will go through construction.

**ROUTE NO. 9, Sections 1 and 2—Under construction between Perryville and West Portal.**  
Detour via Clinton, Glen Gardner, Hampton, Asbury, West Portal.

**ROUTE NO. 9, Sections 9 and 9A—Under construction between Bloomsbury and Phillipsburg.**  
Detour in Bloomsbury via Stewartville and Straw Church to Phillipsburg. (Detour may be in effect as soon as this information is in the hands of the traveling public.)

**ROUTE NO. 10, Section 1-B—Under construction between Arcadian Way and Anderson Avenue.**  
Detour over Bluff Road to Anderson Avenue.

**ROUTE NO. 11 Section 1—Main Street, Passaic, under construction.**  
Short detour over local streets.

**Market Street, Paterson, under construction (Connecting Routes No. 10 and No. 12).**  
Detour over local streets.

**ROUTE NO. 12, Section 2—Under construction between Parsippany and Denville.**  
Detour at Cobb's Corner, Littleton, Morris Plains and Tabor to Denville.

(The following detour on Route No. 13 is not marked and is merely suggested.)

**ROUTE NO. 13—Which is the Lincoln Highway, is under repair between Lawrenceville and Princeton.**  
Traffic is advised to detour via Washington Street, Princeton, across Carnegie Lake and the canal to the Brunswick Pike at Penn's Neck, turning south over the Brunswick Pike to the City of Trenton.

**NORTH-BOUND TRAFFIC** will take the reverse of this route which is out Brunswick Avenue, Trenton, continuing out the Brunswick Pike to Penn's Neck just east of Princeton, where traffic will turn to the west going over the canal and Carnegie Lake through Washington Street to Nassau Street, Princeton, and turning north on the Lincoln Highway and going to New Brunswick.

**ROUTE NO. 15, Sections 2 and 3—Under construction between Bridgeton and Millville.**  
Detour beginning at the corner of Commerce and Walnut Streets, Bridgeton, thence northerly over Walnut Street to Irving Avenue, thence easterly over Irving Avenue and Beaver Dam Road through Carmel to the intersection of Route No. 15 and the Beaver Dam Road near Millville.

**ROUTE NO. 16, Section 3—Under construction between Bedminster Corner and Pluckemin.**  
No detour necessary. Traffic will go through construction.

rail was then exposed to its depth for a distance of 15 or 20 feet and was later found 2 feet up in the air. I beg your indulgence for these few remarks in answer to the questions that you have asked.

**MR. GAGE:** Since the subject of this discussion is Concrete and there are a number of contractors present, I would like to state that the Department has made several changes in the 1922 specifications covering the construction of a concrete pavement. Since these changes affect both the aggregate and the method of constructing this pavement, it is suggested that contractors examine the 1922 specifications very carefully before placing bids for work to be constructed under them. The preparation of the sub-grade has also been changed. In the past, it was assumed that the contractors would make the necessary effort to prepare the sub-grade in the manner desired or required, but the Department has found that they frequently took advantages of the liberty thus offered and did not properly grade or prepare the sub-grade. It has been the usual custom to only prepare the sub-grade as fast as the mixer was moved and it was very seldom that a subgrade was properly wet before the concrete was deposited thereon. The work of our core drill has shown the damage that has been done to our pavements by not having the sub-grade properly prepared.

The 1922 specifications require the sub-grade to be prepared at least 400 feet in advance of the mixer, also to be wet at least 50 feet in advance of the mixer. The final finish has to be secured with a mechanical finisher resting upon the side forms. The manner in which the sub-grade is to be sprinkled is definitely defined and the depth to which the water must penetrate for each type of soil is also specified. Again, there is no doubt but that considerable strength of the concrete has been lost by not having it properly cured. To remedy this, more specific requirements have been used regarding the curing of the concrete. Personally, I do not think a contractor should be paid for a concrete pavement if it is found that the concrete has not been properly cured and allowed to dry out at frequent intervals during its initial life.

As to the length of the slab, experiments have shown that the number of transverse cracks increased as the width of the slab decreases which is to be expected.

In regard to the proper distance to place joints, will state we are subjecting our highways to causes which produce these cracks. As soon as we have these causes properly defined or eliminated, we can no doubt establish a definite length of slab which may differ considerably from that which is in ordinary use today.

**MR. BURKE:** It is rather amusing to hear Mr. Gage representing himself as the State. I would like to ask Mr. Gage if by inserting these things in specifications, whether he could come out and apply these different things they impose on contractors, meaning a mechanical sub-grader. This would mean buying more trucks at an additional cost of several thousand dollars. It is compelling the contractor to use a mechanical sub-grader and put other equipment that he has, out of use. You cannot get in on the sub-grade if the sub-grader is at work. I do not think that it is fair to add that expense to the contractor or the cost of the work. I would like to ask Mr. Whitcraft if he advises the same thing in the field as talked of in theory. I will answer by saying, no. On the job Association men come and find fault and ask the contractor why he doesn't do so and so. We tried this out once and the job got all mixed up. The Contractor had to straighten the job out and not as much concrete yardage was laid before as afterward. Theory is one thing, but theory should not interfere with practice. Theoretical men on the job should not interfere with the contractor. The state has inspectors to interfere with the contractors.

**MR. GAGE:** I do not know where or how Mr. Burke acquired the idea that I was assuming to be the State or New Jersey or the Highway Department. I simply stated the improvements that have been made in the 1922 specifications, which are facts. These changes were not made by me, but represent the combined efforts of the entire Department which were approved by the Highway Engineer before being used; also, the equipment and different methods specified to be used were only incorporated in the specifications after joint conferences with the various material men, equipment manufacturers and contractors.

One reason for desiring the use of the sub-grader is based on the fact that it is very seldom that we have found that the pavements have the required thickness at all points. Certain slabs in some jobs were found to be only 4 in. thick instead of 6 in. The contractor assumed he had the required thickness, but the core drill has shown that this assumption is not very beneficial to the State. Consequently the changes made in our 1922 specifications have most generally been along the lines to assure that the State would get what it is paying for.

Answering Mr. Burke's question, regarding the sub-grader, will state the information we have from those who have used it and the manufacturer, is to the effect that traffic can pass by this sub-grader on any road eighteen feet or more in width. Consequently, materials can be delivered to a concrete mixer over a subgrade on which this sub-grader is being operated.

**MR. BURKE:** If a contractor will give 4 in. or 6 in. he can do it just as well with a sub-grader as any way else. Contractors do not go out with the intention of putting 4 in. instead of 6 in.

**MR. GAGE:** I am not disputing the contractor's intentions, but I am telling you what we have found. It may be that the contractor was not there when the defective pavement was constructed which usually appears to be the case.

**MR. HOWARD:** I had an opportunity to examine quite a lot of concrete road work in this State last summer and observed that the lower portion of the concrete got more or less mixed with the sub-grade. The water was absorbed by the sub-grade and there was not enough left for the concrete. With concrete 6, 7, or 8 in. thick there is always that layer of 1 in. or 1½ in. or over of weak concrete. It is due to getting it mixed with the sub-grade and the sub-grade absorbing the water which should have gone to the cement. It is wise that the sub-grade should be quite moist to insure plenty of water there to cure the cement and not have it absorbed away by the sub-grade.

As to the requirements of what machinery and tools should be used by the contractors. We cannot dictate to the contractors what tool they shall use. The State requires him to construct a certain structure, but should not state what tools shall be used in its construction. The contractor has a legal right to use any tool. I have in mind a case where a contractor insisted on mixing concrete with shovels. The case was taken into court and it was decided that it was the business of the engineer to see that the concrete was thoroughly mixed and held that the mixing method was the right of the contractor. The use of concrete mixing machines written into specifications have been thrown out, as the State could not dictate how it should be mixed. I warn you, do not dictate what machinery to use, how to grade, and how to mix. It is absolutely impossible to sustain your action if the contractor rebels. A sub-grader is splendid in the open country where there are uniform conditions. In the middle West it works out very efficiently. Be sure the specifications as they are written are right as to the quality of materials to be used.

**COL. WHITTEMORE:** The remarks heard suggest to my mind similar conditions. On Long Island some people attempted to build a reservoir. The specifications were very voluminous and exacting, and the contractor, I do not hesitate to use his name—Freil—insisted that they should have the full number of inspectors to see that the specifications were carried out to the fullest particular. In the end, it was said the contractor must guarantee the reservoir would hold water. They never were able to make it hold water. They held back from the contractor \$300,000. He proved that he had complied with every particular of the specifications and the court and jury held that as he had complied with all the requirements, because the reservoir would not hold water was the fault of the specifications and not the fault of the contractor, and he got his money with interest.

In Massachusetts some misguided men undertook to tell a contractor how to do his work. He promptly told them he was under bond to do the contract, with sureties, and he was required to do the work and not the inspector. It seemed to create a new idea among those who were trying to interfere with the contractor. See that the specifica-



# The Highwayman of New Jersey

tions are complied with but otherwise don't interfere with the work of the contractor.

MR. GAGE: Are Mr. Howard's statements based on concrete pavement or concrete base?

MR. HOWARD: The particular job I have in mind is a concrete base on which I made a very thorough examination.

MR. GAGE: Mr. Howard's statements do not agree with the results secured with the core drill. Where the excess water was absorbed out of the concrete by the sub-grade, the quality of the concrete has invariably been improved. It would thus appear that it would be beneficial not to wet the sub-grade, but permit it to absorb the excess water in the concrete. This, we have tried, but unfortunately this absorption produces cracks in the bottom half of the slab which will eventually extend through to the surface. It has also been noted, that, when a method of finishing is followed, which accumulates the excess water in the upper half of the pavement without removing it, such as is frequently done with the finishing machine, the strength of the concrete in the upper half of the pavement will be less than that of the bottom half.

MR. TEMPERLEY: I would like to ask a question. Where concrete pavements are laid with a center joint it is not quite clear in my mind, how you increase the transverse strength four (4) times.

MR. WHITCRAFT: The statistics compiled by several states show the amount of transverse cracks to be greater in one state than in another. Pennsylvania has not been carried away with the idea of the center joint because the pavements do not show enough cracks to make it worth while. This question was considered in connection with local conditions. However, I believe the adoption of these features are well justified in New Jersey. The results that you get over a period of years determine this. As I said, Pennsylvania did not think they were justified in going to the expense involved to offset the number of cracks that they have.

MR. TEMPERLEY: I do not quite get how this joint increases the transverse strength four times.

COL. WHITEMORE: I will now call the discussion to a close because it has become about mechanics and not about concrete.

## Maintenance of Macadam Roads

By W. A. Van Duzer  
Asst. Maintenance Engineer Pennsylvania State Highway Dept.

Several of the states, particularly those in the East, have large mileages of stone and macadam highways. This is accounted for, in a measure, by the construction of toll roads during the forepart of the nineteenth century. These were augmented from time to time by the building of this type by townships and counties.

Previous to the advent of the automobile this road answered every purpose. With the intensive auto traffic and general adoption of the motor truck for local and long distance hauling, road authorities were confronted with the immediate necessity of building roads or repairing those already in existence to meet these modern traffic conditions.

There was a general clamor from all parts of the country for continuous mileages of smooth riding pavement. It was early seen that with the methods employed, the construction of the old type of waterbound macadam was obsolete, but with the perfecting of scarifiers, stone crushers, and other modern road building equipment, it became possible to improve the large mileage of stone roads in such a manner that, with but very few exceptions, they have stood up remarkably well. This success has been possible by early determining to use large stone macadam, thoroughly bonded and cured and preserved by a consistent policy of surface treatment.

Webster's definition of maintenance is "To hold or keep in a state of efficiency," also "not to suffer to fail or decline." In this paper we will discuss only the special points which enter into the economical maintenance of the waterbound macadam type of pavement.

### Resurfacing

The following actual operations enter into the resurfacing of a macadam road: The preparation of the base, which includes: rebuilding of weak spots; sub-draining springs or spongy places; grading to take out depressions; and scarifying to form a uniform cross section, so that an even depth of ballast can be spread. One of the most important points in this preparatory work is to have all pipes and drainage structures placed in advance of actual resurfacing so that the necessary back fill will have had time to settle.

The ballast used in Pennsylvania must meet the follow-

ing requirements: It must consist of clean, tough, durable crushed rock, with a French coefficient of not less than 10 and shall be uniformly graded and of such size that it will pass over a screen having circular openings of not less than 1½ inches, and through a screen with circular openings not more than 3½ inches in diameter, our preference being to use as large a size as possible depending upon the finished depth of surface to be laid.

The screenings shall consist of material prepared by crushing rock of approved cementing quality, free from dirt and other foreign substances. It has been our experience that screenings with a large percentage of dust, give better results, in that the voids are better filled, and the tendency to ravel before surface treatment is considerably lessened. The chips fill the top voids and prevent the dust from going to the bottom with a consequent loosening under traffic.

The general practice is to place the ballast ahead of the section where it is to be eventually used. The screenings are dumped to the side on the previously prepared shoulder. This is done so that each will be spread as necessity requires. The finished work more than justifies this additional expense. Some success has been obtained by special spreading devices used in connection with dump trucks.

The ballast is thoroughly dry rolled with a 3 wheel 10-ton power roller until the stone does not creep or wave under the action of the roller. The screenings should then be spread fan-wise from a shovel and thoroughly broomed into the voids in the stone, the rolling to continue from the sides toward the center until all voids are thoroughly filled, but no appreciable mat formed. The water is then applied ahead of the roller, and the rolling continued until a grout is formed. This grout flushes to the top, and is evenly spread over the roadway by the action of the roller. While it is not absolutely necessary, we believe it is better if the road is allowed to dry before being thrown open to traffic.

We have tried to cover the materials and methods used in the construction of a first class macadam road, inasmuch as economical maintenance can be built into a highway by the exercise of judgment. This judgment is based on experience as to what will give longest life in connection

with subsequent maintenance, which consists, to a great extent, of proper surface treatment and intelligent and careful patching.

### Surface Treatment

Before the application of the surface treatment a macadam road should be cured by the action of traffic for at least two months. The maintenance during this time consists principally of sweeping, either by caretakers, or lightly by mechanical broom or horse-drawn sweeper. This sweeping is done for a dual purpose: first to remove the cake or matted screenings from the edges. This we deem is extremely important, and unless care is used will necessitate extra treatments. Second to place these screenings in the center of the highway, where they have been removed by the action of traffic. The screenings which are swept back to the center will prevent the road from raveling and assist in curing it. Under exceptionally heavy traffic it is found necessary to add dry screenings and occasionally during hot dry spells the sprinkler can be used to advantage both in holding the road and assisting in the curing action. But, under no circumstances should a road which is not broken up be re-rolled, as this breaks the bond and destroys the value of traffic curing action.

Previous to the first application of bituminous material, which we believe should consist of a low viscosity tar, in order that a maximum penetration can be obtained, the screenings must be removed by sweeping so that the voids will show between the ballast to a depth of possibly ¼ of an inch. The tar should be applied in two treatments by a pressure distributor, if possible, or other mechanical means. The first application to be approximately 1-3 of a gallon to the square yard and the second from 2-10 to ¼ of a gallon per square yard. Our experience has been that a third of a gallon applied will penetrate the road. The second application will heal up the spots that are not thoroughly bonded or are loosely bonded, but will not fill the voids, and leaves the ballast to take the wear with the tar as a binder. The second application may be either a high viscosity tar or asphalt and the quantity should be just enough to fill the voids, which can only be determined from experience, but usually runs from .25 to .3 of a gallon per square yard. On a road that carries extremely heavy traffic we occasionally skid chip it on the first application, that is apply from 3 to 10 pounds of chips to the square yard as a safety measure, particularly on heavy grades and narrow roads.

Hard stone chips ranging in size from ¼ inch to 1 inch in size, dustless, and free from dirt, should be used with the second treatment, at the rate of 20 to 30 pounds of chips per square yard or approximately one cubic foot of stone chips to one gallon of bituminous material. Owing to the large chips used and to assist in pushing the chips into the bituminous material, the treatment should be rolled either with a 5 to 8 ton tandem or 10 ton macadam roller. The roller can be used as soon as the chipping is completed, but equally good results are obtained if the road is rolled 24 to 36 hours later, if a rapid drying bituminous material is not used.

We have obtained the best results by three successive treatments. The third treatment may be either a high viscosity cold tar, water gas tar or asphalt, or as an alternative a hot asphalt having an asphaltic content of 88 to native a hot asphalt having an asphaltic content of 88 to 95 at 100 penetration, or a consistency (float test) of approximately 150 sec. at 50 degrees centigrade. We apply from .15 to .25 of a gallon per square yard, which requires from 30 to 40 pounds per square yard of covering material. This treatment must be watched carefully, as the roadway will bleed after it is thrown open for traffic, and, if not given proper care by application of chips, will pick up badly under steel tire wagon traffic. If the treatment is made late in the fall it may require rechipping after the beginning of hot weather in the spring.

### Caretakers

The necessity for uniform continuous maintenance is probably greater for the waterbound macadam type of construction than for any other. The advantage of thor-

oughly experienced workmen is unquestioned and considerable care must be exercised in picking the organization and seeing that proper instructions are issued covering each phase of the maintenance work.

There are two general systems recommended for carrying on the maintenance of these roads, both of which have their advantages. They are the caretaker or patrolman, and the patrol crew or gang. The first is closer to the ideal if properly controlled. This plan arranges the road mileage in sections of from three to five miles in length with a patrolman, properly provided with tools, materials, etc., whose duty it is to keep up the small repairs and emergency work, and with authority to hire additional men, teams, etc., when instructed by their immediate superior. These caretakers keep the surface patched and all depressions filled; see that the side gutters and cross drains are kept open; paint slight surface depressions and sprinkle with chips tamped in place; larger depressions are filled with larger stone and topped with patching tar and chips, the mix being in a proportion of 1 to 12, or 1 to 14, depending to some extent upon the weather. In case of failures due to stopped drains or springs the whole section is dug out and drainage placed leading to the gutter or culvert and large stone laid to bring up the base. The ballast and screenings are hand tamped in place if no roller is available and the spot painted and given a mixed patch of tar and chips.

These patrolmen file daily report cards, giving the nature and extent of the work, hours engaged and particular kind of work performed, in order that the cost data may be properly computed.

The patrol gang is an organized force of picked men, provided with tools, materials, etc., to maintain road mileages of various lengths. As far as overhead expenses are concerned it is possibly more economical than the caretaker system, the men being well trained and efficient for each class of repair work. The difficulty, however, is that a force of this kind cannot give each section the required attention, especially in emergency cases. The work cannot be accomplished simultaneously as in the caretaker system, which we deem is the real factor to be desired. The gang system, is, however, an insurance against shortage of labor upon those sections of the road that are removed from the thickly populated districts. The matter of control of a force of this kind can be taken care of by a full report of the operations and the expenses of the work. This method was used by us to a great extent in the past few years on account of the labor shortage during and directly subsequent to the war.

### Maintenance of Second Class Macadam

Naturally where so many miles of road have to be maintained a highway department must have a large mileage of ordinary stone, or second class macadam roads, the maintenance of which is entirely different from the rebuilding operations covered previously except as to general repair operations.

In certain rural sections where the travel consists mostly of horse drawn vehicles, the ordinary stone roads are kept up merely by an application of stone which is edged by dust or side material to keep the larger stone in place while the action of traffic and weather cements it. When this method is used it is sometimes called, for want of a better name, Unbound Macadam. The size of stone used in this class of work is from ½ inch to 1½ inch, with dust removed as it only sifts to the bottom and is of no value, and a sufficient quantity of dust is formed by traffic to hold and cement the ¾ inch stone in place.

When a road has been brought up to an approximately uniform cross section and grade by local treatments of stone, just referred to, and traffic conditions warrant, an application of a high viscosity tar is given at the rate of 1-3 to 2-3 of a gallon per square yard, the larger amount in two applications, the rate to be governed by the depth of loose stone and to be varied accordingly. In this manner a road may be kept in comparatively good riding condition for a few years until funds are available for a more permanent type of construction.

## Discussion of Mr. Van Duzer's Paper

By A. W. Muir

Supt. of Maintenance New Jersey State Highway Department

I feel that Mr. Van Duzer has covered the subject in a general way to very good advantage. There are, however, a few points upon which I should like to ask him some questions in order to bring out certain points which are not clear to me, or which may not be clear to those who have had no experience in the use of the large stone. It will be noted that what Mr. Van Duzer terms large stone macadam is macadam constructed from a material the grading of which very closely complies with the 1922 specifications for two and one-half inch stone in New Jersey. Mr. Van Duzer's grading is over a screen having circular openings of not less than one and one-half inches and through a screen with circular openings of not more than three and one-half inches in diameter.

The new grading for what is known as two and one-half inch stone in New Jersey is as follows: One hundred per cent through a three and one-half inch ring; ninety per cent through a three inch ring; zero to twenty-five per cent, through a two and one-half inch ring; and zero to five per cent, through a one and one-quarter inch ring.

One of the problems which has confronted the State Highway Department in its construction of large stone macadam has been the procuring of a sufficient supply of screenings for binding up the large stone. I note that Mr. Van Duzer states that the screenings shall consist of material prepared by crushing rock of approved cementing quality free from dirt and other foreign substances. The great difficulty in New Jersey has been to get screenings which are free from dirt and other foreign substances. There is an ample supply of screenings which have an average of possibly twelve per cent, of dirt and other foreign substances, but screenings which will comply with Mr. Van Duzer's specification seem to be available to an extent of not over twenty-five per cent of the demand. The Department during the past season received a car load or two of screenings from a Pennsylvania pro-

ducer, which I am sure, from the same material as is used in the Pennsylvania Highway Department, is of a better quality than the screenings which we have in New Jersey. I should like to ask Mr. Van Duzer if he has had any experience in the use of this material in the construction of large stone macadam. The question has therefore been raised, and it is a question which I should like to ask Mr. Van Duzer, what is the best method of handling the work?

If I understand Mr. Van Duzer's paper, the purpose of Pennsylvania is to dispense with the use of screenings in the construction of the road, and the material is to be bound and it is then spread from the trucks by hand. In this connection, I should like to ask Mr. Van Duzer, if additional expense is incurred by this practice, and what, in his opinion, are the advantages of this method of handling the work?

The manner of rolling and spreading of screenings is, in my opinion, of utmost importance. I feel that at this point of the work, very much depends upon the best results will not be obtained. I feel that Mr. Van Duzer's point in regard to the forming of a mat should be particularly stressed. It is my observation that there is a very strong tendency among the men in the field to apply the screenings in too large quantities, with the result that a fine surface is obtained temporarily, but that instead of having a thoroughly bound up macadam, the real result is a crust on the surface which soon disappears, followed very rapidly by the insufficiently bound large stone. This last point has a particular bearing upon the next portion of Mr. Van Duzer's paper; namely, the matter of surface treatment. Many of the men in the field are of the opinion that it is necessary to follow up the completion of their work almost as rapidly as possible with a surface treatment in order to hold the road, this being in direct contradiction to Mr. Van Duzer, who holds that a macadam road should be cured by the action of traffic for at least two months before the application of any bitumen. It is my belief that this latter point has been very thoroughly covered by Mr. Van Duzer in his outline of the procedure to be followed in patrolling the finished work during the interval between its completion and the application of the bitumen, and that the success or failure to obtain a properly cured pavement lies in the care with which the patrolling is carried out. The point which Mr. Van Duzer makes as to re-rolling of a road is of particular interest, as the statement is often heard that a macadam road cannot be rolled too much.

Having formed and cured our water-bound macadam, Mr. Van Duzer now comes to the matter of surface application. I should like to underscore particularly one point which he makes in regard to the preparation of the surface by sweeping; namely, the matter of the removal of screenings on the surface. It is my belief that a very large portion of the scaling off of surface treatment is due to no other cause than the fact that small patches of the crusted screenings have been left on the surface, which crust becomes loosened from the large stone under traffic, and fine cracks are formed which allow water to penetrate, with the resultant peeling off of the surface treatment. This, I believe, is borne out by the fact that such failures in surface treatment show up to only an almost negligible amount in dry weather, but are very apparent immediately after a rainy day.

Mr. Van Duzer has sketched for our information the procedure in Pennsylvania in surface treating water-bound macadam, but there are one or two points in connection with the treatment which I shall be glad if he will bring out somewhat further: First, the interval between the successive treatments; second, if any cover applied on the first treatment, and if not, is there not considerable complaint from the public owing to this practice; third, I shall

be glad if he will give us the analyses of the different grades of material used in Pennsylvania, as it is my understanding that, particularly in the tars, Pennsylvania uses at least one grade of material not in use in New Jersey. I might say in passing that any information which Mr. Van Duzer can give the Convention on surface treatment will, in my opinion, be well worth receiving, as Pennsylvania has many miles of surface treatment work which the casual observer might easily mistake for bituminous concrete, and which are excellent examples of the results which it is possible to obtain from proper application of surface treatments.

Mr. Van Duzer, in his outline of maintenance of surface treatments, has sketched for us the most generally accepted methods of caring for surface treatments, and pointed out quite clearly the advantages of the different methods.

I regret that Mr. Van Duzer has not devoted more time to the matter of the maintenance of what he terms "Second Class Macadam", as I believe the methods in use in Pennsylvania are practically unknown in New Jersey, not so much in regard to the aggregates used in this work, but particularly in regard to the use of bitumen. The method of constructing unbound macadam is, I believe, a distinct innovation in the handling of broken stone roads, and where traffic conditions warrant its use, I believe that Pennsylvania's experience will warrant authorities in charge of such roads in adopting the method.

COL. WHITTEMORE: Gentlemen, this is an exceedingly important subject, suggesting a great many questions which I know will be presented. This interesting discussion might extend until the dinner bell tonight. It is nearly 12 o'clock now, but if there are any questions pertinent to this subject, I am sure Mr. Van Duzer will be glad to answer them to the best of his ability.

MR. GAGE: This method of reconstruction is comparatively new in this State yet the Highway Department has had specifications defining it for over three years. An effort has been made to have it adopted and used by the various counties as well as our own Department, but apparently very few saw any merits in it and would not believe that desirable results could be secured by such a method.

In the preparation of our specifications defining the various sizes of stone to be used, this method was kept constantly in view for we realized that the time was not very far off when it would have to be adopted. Consequently, the stone required for this method of construction is the next size larger than that required for use in concrete. A few years ago, the writer inspected a quarry where they had a very large stock pile of 2½ in. stone and they were then crushing this size stone to increase their output of ½ in. stone. During the past season, I believe, the Department had difficulty in securing deliveries on 2½ in. stone for apparently the demand exceeded the supply.

It is certainly very gratifying to have Mr. Van Duzer present their experience with this method of construction in such a manner that hardly anyone can doubt its merits. Mr. Muir's experience of last year showed that the State was fully justified in adopting this method of construction.

When the proper care is taken to see that the 2½ in. stone is thoroughly bonded and the top surface is free from all binding material or dust when the initial bitumen is applied, there is little doubt but that satisfactory results will be secured. It is, however, very regrettable that we do not have more time to discuss the light oil treatment, especially that of tars on macadam roads. I am afraid that many who have heard this lecture may think that it is necessary to use more tar or oil per square yard of surface treatment than what is really required. It is very important that the quantity used be the minimum amount in order that a bituminous layer will not be built on top of the larger size stone.

The methods in general use in this State for surface-dressing an old macadam road have been to apply a certain quantity of oil each year with the necessary metal covering. This method has gradually built upon the old macadam roads a bituminous layer which in many cases is from three to four inches in thickness and is composed principally of screenings and bitumen. Each year this layer develops more pronounced bumps and depressions than in previous years and apparently each treatment increases these bumps and deepens the depressions.

This type of pavement surface might be satisfactory in some localities where the inhabitants are not accustomed to any better types of road, but it is certainly not satisfactory to the majority of motorists in New Jersey.

There is no denying the fact that our macadam roads are not properly maintained. It is foolish to assume that we can constantly go on patching and re-patching them in the manner we have been doing for the last five or ten years. Some definite method of reconstructing them will have to be adopted and it is quite evident that, since our mileage of this particular type of road is exceedingly large, the cost for re-building them will have to be reduced to a minimum. It is the writer's belief that the above method described by Mr. Van Duzer will be found the most suitable and economical to be used for this purpose in the majority of cases, and, if generally adopted in the near future, it will mean a tremendous saving in the cost of maintenance of our macadam roads during the next few years; also, if at any time it is found that this type of construction cannot be economically maintained on account of the heavy traffic conditions, very little extra expense will be required to put this surface in condition to be used as a foundation for a bituminous pavement of the mixed type. It certainly will be a better macadam base than that now being used for the 2½ in. stone is more firmly bound together and nearly waterproof to the passage of underground waters.

We certainly should take the utmost advantage of Mr. Van Duzer's paper and see that the Counties and Townships are supplied with copies of it.

MR. MUIR: I am quite sure, is well satisfied with the results obtained by this method of construction and will not dispute the economic advantage to be secured by the use of the larger size stone. As I have previously stated, there is a tremendous mileage of County and Township roads that should be re-surfaced in the near future and the writer believes that the Department should exert their utmost efforts in having the various Counties and Townships adopt this method. It certainly does make a very desirable type of pavement for ordinary motor traffic. It, no doubt, will reduce the quantity of certain types of road material to be used, but roads should be constructed more for the benefit of the traveling public than for the material men. It is recommended that Mr. Van Duzer's paper be reprinted in our Highway publication, known as the HIGHWAYMAN.

MR. STANLEY: Mr. Muir asked a question in his paper that I would like to have answered.

MR. VAN DUZER: With reference to the first question about spreading the stone: Does the re-handling of the stone get results and do we get results that justify the expense? I believe we do. By hauling stone with trucks, the old method was to raise the dump body and spreading the stone along the road. Very often the stone stuck and you had a bump. You either had too much stone or not enough. Our idea is this: If you can spread and handle all the stone you will keep away the segregation and get a uniform surface. We also use a template on our sub-grade and also on the finished road, also a 10-foot straight edge. There will be enough waves in a macadam road anyway, and we must take into consideration the kind of men we have working for us and every mechanical means that you can get should be put into the foreman's hands to save labor, so that there is much more assurance of getting a real road when you get through. As far as expense is concerned, it really means only one or two additional men. We usually have about 5 men for laying from 200 to 250 feet a day, and it takes about 40 or 50 ton to the 100 foot. It does not cost over \$200 to \$300 per mile, and \$200-\$300 per mile is not out of proportion when we sometimes spend \$7,000 or \$8,000 per mile for maintenance.

Another point questioned by Mr. Muir was surface treatment and I want to clear this up in connection with how far apart to make the applications of this treatment. If the road is built early in the spring, that is, if it is completed along in May, we generally give a treatment probably the latter part of June or the middle of July, and that is our priming coat. If the road is carrying exceedingly heavy traffic, we will probably put on the second treatment along in September or the first of October. We do not believe it is good business to put on the second

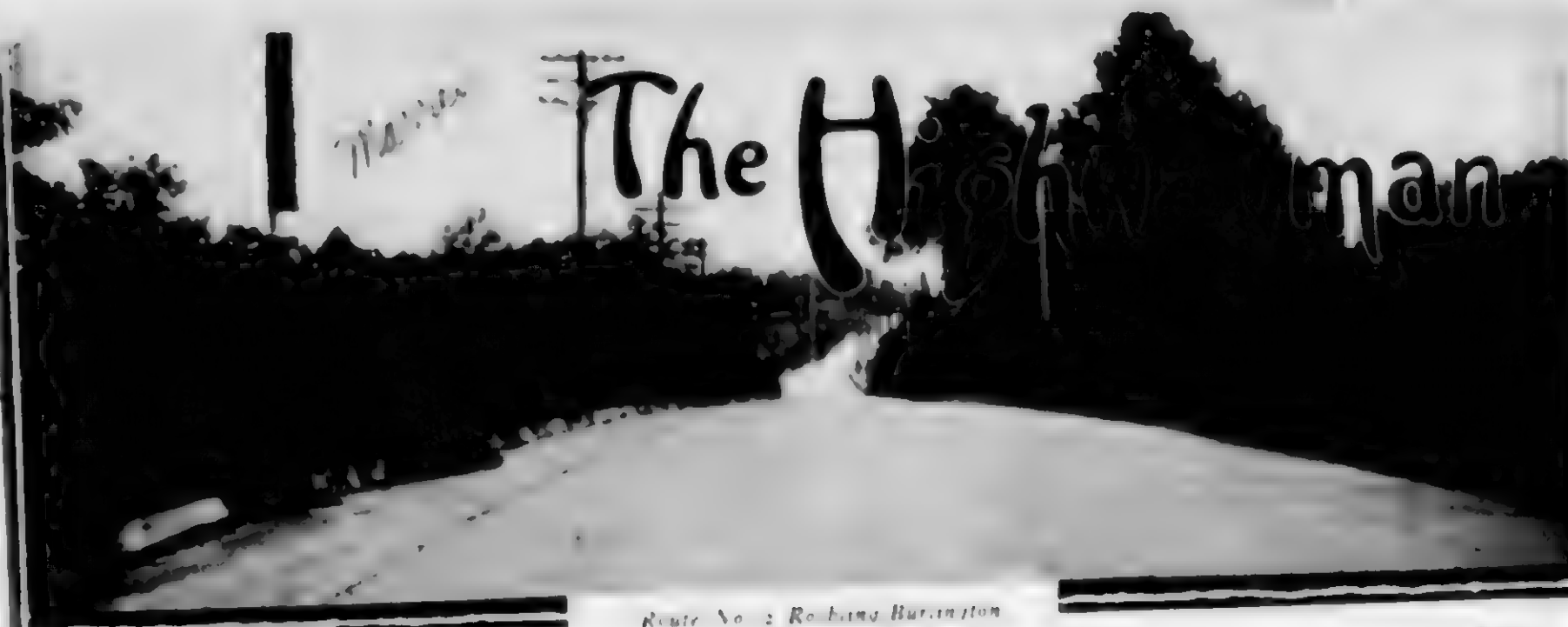


Mr. STANTON: I would like to ask Mr. Van Duzer if

Col. WILLIAMSON, Chairman.



Just ask to be put on the Highwayman's list. A postal will do.



Book No. : *Robbing Burlington*

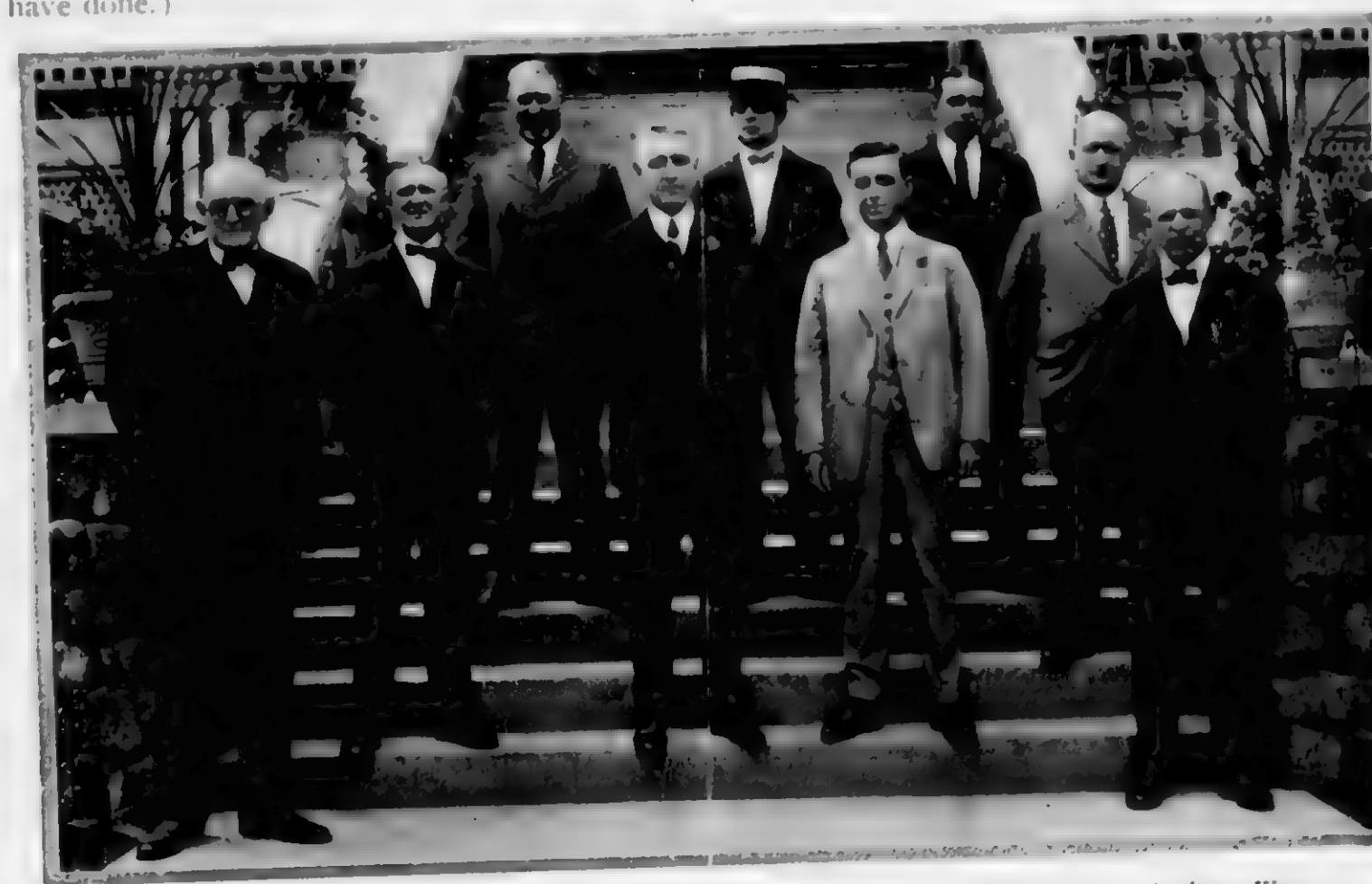
## The Highwayman Is Out For More and Better Roads in New Jersey

August, 1922  
Vol. II  
No. 1

## Detour But Follow the Arrow!

Every one of these men, fairly early in life, acquired a *purpose*—a fixed, fairly definite goal which he aimed at (just as you, perhaps have done.)

Study the story of my successful n  
you will find that he did not have a  
Highway to Success. Often, he had  
tour". But—always he *followed the ar*



Back Row—left to right—Commissioners Whittemore, Paddock and Burton; State Highway Engineer Wasser  
Front Row—Commissioners Doughty, Seabrook, Collins, Ferris and Duffy.

The history-old engineering which began with milk, ends with gasoline.—*Highway News Digest.*



# The Highwayman of New Jersey

Over H. C. Shinn from an "officially approved" photograph. Harry's special assignment in this case being to find that No. 88 Planet Junior school bus.



The Manager's last assistant, Harry Shinn, who is now in the field, is the one who is the only one who can find that No. 88 Planet Junior school bus.

## "H. C." Shinn, Manager of Homestead Farms and Engineer of Special Assignments

Somewhere in the official records of Lakewood, New Jersey, you will find that "H. C." S. once stood for Harry Clinton Shinn—but that has long since been forgotten by everyone except those most directly interested. H. C., who is sometimes known as "Harry" admits on close examination that he was born in Lakewood, New Jersey. This fact alone should be sufficient proof of the high regard in which H. C. holds "truth, the whole truth and nothing but the truth."

Harry started his engineering experience with the Lakewood Water, Light and Power Company, in 1905. Subsequent engagements in the engineering field found him in March, 1912, employed with the DuPont Powder Company, with which company he held a responsible position in the layout, arrangement and studies for extensive powder plant development, construction of railroad sidings, pipe lines, etc. Leaving the DuPont Powder Company he carried on private practice in Bernardsville, N. J. In 1918 he was appointed County Engineer of Ocean County. He resigned this position to become connected with the State

Highway Department. While with the Department he has held the position of Assistant Engineer, Assistant Division Engineer of the Central Division, Supervisor of State Labor, and Engineer of Special Assignments, which is his present position.

We nearly forgot to mention that "Harry" was at one time a salesman. We do not know why he does not mention this in his autobiography for we are sure he could make a success of anything that he tackled.

This is best exemplified by his recent agricultural achievements. With the aid of a "Planet Junior" No. 25, and Skinner overhead irrigation, he has succeeded in raising a wonderful vegetable garden. "H. C." claims that the former machine almost surpasses the "Puddle Jumper" as a source of pleasure. The irrigation system is held largely responsible for the recent heavy rains. Besides being able to raise enough vegetables to supply Lakewood proper, he has raised four fine healthy boys. Harry is a student of human nature and is the greatest little arguer we know of. He is enthusiastic, full of "pep" and a fine fellow.

## Paving Inspection

The first requisite for proper relations between the engineer and the contractor is clearly worded specifications. Every clause should be expressed in good English. Specifications which need constant interpretation and frequent appeals by the inspector to the engineer cause delays, and therefore loss of money to the contractor.

### Co-operation Between Inspector and Foreman

The contractor's foreman or superintendent, to be of any use, must be a man who can overcome obstacles and meet emergencies as they arise. He, therefore, is likely to resent what he considers constant interference with his work by an inspector who is not only young, and inexperienced, but perhaps undiplomatic as well. On the other hand where the inspector's suggestions and orders are given in a sensible way and with a real desire for co-operation, they ought to be received in the right way, for the foreman or superintendent who engages in constant disputes with the inspector may be wholly unfitted to bring about the co-operation which the contractor desires with his customers. Of course there are contractors who do not read the specifications before they bid. In other words, they do not really know what is expected of them and only trouble can be expected from any such situation as this. But where the inspector takes the attitude that he is there not only to see that the job is done in accordance with the specifications, but to make the job go along quickly and smoothly, the relations between him and the contractor are bound to be harmonious, and without harmony no organization can possibly work as it ought.

### Inspector's Interpretation of Specifications

With regards to the inspector's interpretation of the specifications, it cannot be too strongly stated that all specifications must be interpreted with common sense. If he is supervising the laying of granite block pavement, he must realize that these blocks are not pieces of mosaic. To be unduly careful about the straightness of the rows, or the widths of the blocks in the rows or the wideness of the joints, and then not to see that the cement grout is properly mixed and placed is to show lack of knowledge as to where to make the contractor live up to a literal interpretation of the specifications.

This same idea applies to those above the inspector. If every time the engineer visits the job he talks about something that is wrong—especially if it is some small matter—and rarely says anything about what is right, he soon gets the reputation of being impractical, and he probably is. If that foreman or superintendent is worth anything at all, the job he is running is to him the greatest job there is, and to have someone find fault with some minor point discourages him and results in no good. Not that a man should be constantly praised, for that is surely not good, but a word of encouragement at times will often do more than fault finding to bring about a desire on the part of the contractor's foreman to do his best, which is surely what every engineer wishes. The contractor's superintendent or foreman should be led to look to the engineer as a man having superior knowledge along certain lines, and not simply as a kind of super-censor whose principal job is to find fault.—*Engineering and Contracting.*

## Building Better Bridges

### Bridge Foundations

The security of any engineering structure, whether a road or a building or a bridge, depends primarily upon the security of its foundations.

Foundations are subject to various stresses, brought about by the purpose which the structure serves. Bridge foundations, in particular, are subject to the stresses caused by the bridge structure itself as dead load and the addition of load of vehicles or pedestrians passing over the bridge, or live load. Tendency of the earth fill behind an abutment to push or slide it upon the foundation is another stress which must be met in a proper design. In the case of an arch bridge this push or thrust may act in the opposite direction, causing the foundation to slide into the adjacent earth, and allow the arch to collapse. Still another condition, that of scour, must be given serious consideration. Scour is the action of the stream which undermines the foundations by washing away the soil under them. Recent failures of three large bridges in different sections of the country (one with a heavy toll of lives) have been traced to the undermining of the foundations by scour. To this number might be added scores of small bridges which are carried away by floods and high water each year.

Several types of foundations are used in bridge construction, but the ordinary conditions can usually be met, either by a concrete spread footing on good firm soil or by the use of piles if the bearing power of the soil is inadequate to carry the load. In either case the footing course is carried well below the bed of the stream to prevent scour, and sometimes a cut-off wall on the stream side of the abutment is carried below the foundations proper as an additional protection. In the larger and more important structures, the bearing power is determined by borings taken at the site before the bridge is designed.

Cofferdams of wood or steel sheeting are driven around the foundations to support the adjoining earth, exclude the water and permit of pumping and excavating. Especial attention is required in the installation of cofferdams, in order that they may be as nearly water tight as possible, thus allowing the placing of concrete on a dry foundation bed. Cofferdams should also be built sufficiently large to allow for the building of concrete forms inside of them, thereby leaving a space for pumping between the forms and the sheeting. Extreme care should be exercised in the interior bracing, as the pressure of earth and water may cause the collapse of an improperly braced dam.

Excavation should be entirely completed before driving of piles, and the foundation pit preferably kept dry during driving. While this is not absolutely necessary, it permits better observation of the action of the hammer, and the condition of the pile being driven. The bearing power of the piles is determined from the *Engineering News* formula and averages from 14 to 20 tons per pile. This bearing value is so computed that if the bridge were to suffer from the action of scour, the piles acting as columns, would safely support the structure until the foundations could be repaired.

Following the proper driving of the piles, the heads are sawed off level at a height of from six to twelve inches above the bottom of the footing course. The foundation is now ready for concrete; care must be used in working the concrete around the heads of the piles and pumping continued until concrete is in place.

With a proper realization of the importance of bridge foundations and the exercise of due care in their construction, the bridges now being built by the State Highway Department should safely withstand the traffic demands of this generation as well as any flood conditions to which they may ever be subjected.

JAS. H. HAYS,  
Bridge Construction Inspector,  
N. J. State Highway Dept.

## Value of Federal Aid and Praise for Mr. MacDonald

To those who have doubted the tangible value of Federal Aid to States in highway construction, attention is called to the remarks of Secretary Wallace at a recent hearing before the House Roads Committee, and transmitted among other enclosures in this number of the *Digest*. The flat statement is made that Federal Aid investments have been returned already to the public, and Mr. Wallace explains why. One other point that came out in a spontaneous way was that the conduct of the Bureau of Public Roads under Mr. MacDonald's direction, has evoked less criticism than any other department of the government—a particularly gratifying statement to those engaged in highway work. Such testimony as Mr. Wallace gives furnishes a good support for the adoption of extended Federal aid programs and will aid State highway officials in organizing their departments upon a permanent basis.—*Highway News Digest.*



Driving sheeting for cofferdam at East Abutment, showing bracing piles before cutting-off to given grade. (Bridge No. 84, Route 12, Section 1)



Cleaning up foundation prior to concreting, showing piles cut off to given grade (Bridge 84, Route 12, Section 1) (At right) driving sheeting with steam hammer for cofferdam at East Abutment (Bridge 88, Route 12, Section 1)

# The Highwayman of New Jersey

7



The Highway Department has long needed such a building as the new service station at Fernwood. Being within three miles of the center of Trenton, the building is well located and it will help greatly in taking care of the rapidly increasing work of the Department.

The Highway Department was very fortunate in securing for a nominal amount, 25 acres of land within three miles of the center of Trenton, just outside the city limits, in what is called Ewing Township. It was there decided to build this service station, the location of the property being between a hard surface road in front and a branch of the Reading Railroad in the rear, which enabled us to run a railroad siding into the property. This siding was constructed in a manner which permitted a drop track at the end, which facilitates unloading of machinery without having to block up.

The drainage of the property is taken care of by the method employed by the United States Army at their cantonments. Water supply was secured by driving a well, installing a pumping outfit, with a tank holding 100,000 gallons.

The service station main building is 100x406 ft. These dimensions and building were decided upon after our Department heads made several inspection trips looking over stations and garages within a 100 mile radius of Trenton. Of all locations we visited, we were unable to see anything that might meet the requirements of the Department. We did note, however, all the particular features of these stations and garages that we visited, and after designing our own building, we incorporated therein the features that we noted in these other stations.

The building is principally of steel and glass, with brick curtain walls, and a Monitor light shaft running through the center of the roof, which guarantees maximum light at all times at every corner of the building. The building is divided by a fire wall set back 240 feet from the front. The front is divided into the following departments:

The foreman's office of glass partitions with maple flooring and finished in oak to match the office furniture, about 40 ft. x 40 ft. All records of the Equipment Division will be kept there. Adjoining this is the wash room, toilets, showers and rest room, which is 40 ft. x 40 ft. Adjoining this room is the electric, magneto and repair department, which is about 20 ft. x 30 ft. Next is the carpenter and body shop where all wagon, wheelwright work, and all work pertaining to wood work on equipment is taken care of. This room is fire-proof, and is 30 ft. x 30 ft.

Next in line is the paint shop, also fire-proof, size 20 ft. x 30 ft., with all modern painter's equipment. Next to this is the welding and blacksmith shop, size 20 ft. x 30 ft. This shop is equipped with the latest type of acetylene and electric welding equipment, as well as blacksmith tools such as forges, machine hammers and blowers. Next to this is the stock room 79 ft. x 30 ft., with a mezzanine of the same size. There is a small hand elevator in the stock room to take care of the heavy stock to be placed on the mezzanine floor. There are approximately 7,000 feet of stock bins erected in the lower stock room for small parts for daily use.

The main floor of the building is paved with Kreolite Grooved Block on a concrete foundation. This eliminates fatigue on the men that are required to work around the equipment. On the opposite side of the building we have

a machine shop; next to this we have the unit shops, first the transmission department, then the deferential department, and then a department to care for motors entirely. Next to the motor department we have what we call a special Ford department, where we rebuild and repair Fords. At the further end of the building we have a lye tank where, as soon as a unit is taken from the machine, it is submerged and all foreign particles removed therefrom, so that when the mechanics are required to work on same, it can be done with the least possible inconvenience, thereby assuring our men of being able to work on automobiles with clean shirts and collars.

We have also arranged for a metal department where all radiators are rebuilt and repaired, where metal equipment, such as metal bodies, metal cabs, etc., can be taken care of, designed, and built.

In the centre between these two layouts, we have a space of 40 feet clear for trucks and cars under repair, and is within easy reach of all the other departments.

Beyond the fire wall, we have a boiler room, coal bins, etc., the boiler room being equipped with three boilers and a stack of sufficient draft, same being 63 feet in height. We have also provision for hot water while the boilers are being used for heating only. We have a space beyond this fire wall 160 ft. x 100 ft. where cars, when completely overhauled, are kept and can be assigned to a job at a moment's notice, with the satisfaction that same are in first class condition.

We do not attempt to take care of dead storage in this building and are arranging to build an additional set of storage sheds for housing. The location of the building on the property is about 600 feet back from the front, and will be connected to the main highway with a concrete road. The interior of the building is painted white, except the exposed metal steel girders, which are painted dark green. The general surroundings of the whole structure are such as to produce efficient and satisfactory work from the men there employed.

## What Are You Worth?

According to scientific investigation, the ingredients of a man are as follows:

Fat enough for seven bars of soap.  
Iron enough for medium-sized nail.  
Sugar enough to fill a shaker.  
Lime enough to whitewash a chicken-coop.  
Phosphorus enough to make 2,200 match-tips.  
Magnesium enough for a dose of magnesia.  
Potassium enough to explode a toy cannon.  
Sulphur enough to rid a dog of fleas.  
Water enough for one Saturday night bath.

This whole collection is worth 98 cents, and that in a day when things are three times as high as they used to be.

The only additional ingredient is GUMPTION. According to the amount of that there is mixed in with the other things, you are worth 20c an hour, or \$20,000 a year.



The HIGHWAYMAN has never done any "whitewashing" but we're glad to "show up" driver "Gas" Hoffman, and Hose Operators "Mickey" Dilts and Bill Lawler, of the Highway Department whitewashing crew (Route 4, south of Woodbridge).

## Along Your Highways

Under this heading is presented each month a description of the conditions along one or more of the main roads of the state. If you drive a car, you will be interested in following this series.

### Route No. 4

Starting at Rahway thence through Woodbridge to Perth Amboy, the paving is in fair conditions. Constant watchfulness on the part of the Maintenance Division is necessary, however, in order to hold this route in shape to carry the heavy shore traffic. The pavement continues in fair condition through Perth Amboy.

Between Woodbridge and Perth Amboy the white-washing outfit was encountered. "Gas" Hoffman, the driver of the big Mack truck was telephoning from a nearby station. Photograph herewith shows the big Mack with its tank and swining arms, which allows the hose free play, in order that the operators, "Mickey" Dilts and "Bill" Lawler may coat the guard rail, fences and poles with whitewash.

The accompanying picture shows the whitewash on the bottom of the poles to a height of about five feet. Every motorist knows the value of this kind of white marking for night travel.

The blue pole banding through Perth Amboy, is of distinct advantage to the traveler in guiding him through this city, where many turns are necessary in order to reach the approach to the Raritan River Bridge.

The Perth Amboy-South Amboy bridge, spanning the Raritan River, is a pile trestle frame structure, very difficult and costly to maintain. Sections of this bridge have been carried away at times by ice and severe river conditions, necessitating hurried emergency repairs. The draw span has reached a point where maintenance under present traffic conditions is impractical, it being inadequate to safely carry the loads permitted by law to travel the roads. The Highway Department has, therefore, made provision for the construction of a new bridge at a point west of the old bridge and paralleling same, where a shorter bridge can be built of modern design to provide for the heavy traffic of today.

This, of course, will entail the expenditure of a huge amount of money, estimated roughly at \$4,000,000. The Bridge Division of the Highway Department has investigated conditions at this point, in order to determine with some degree of certainty, the most economical type of construction. 24 pilings have been driven and a load of 1019 tons of pig iron has been imposed upon them in order that the type of construction may be determined. It is interesting to note that bed rock is encountered at an average distance of approximately 115 feet below the river high water mark. The reconstruction of this bridge will add greatly to the convenience, comfort and safety of the large volume of traffic using Route 4. From a point where the south approach to the new bridge will begin, through South

Amboy, a new concrete pavement recently built, greatly improves conditions through that city.

After leaving South Amboy a brick pavement which is a little rough, is encountered, continuing to Morgan; at which point a bituminous concrete pavement on a macadam base in very fair condition continues to Keyport. A recently completed bituminous concrete pavement through Keyport connecting with the concrete and bituminous concrete pavements built several years ago by Monmouth County, carries the traffic to a point known as the Betsy Ross Farm, three or four miles south of Keyport, where a new concrete pavement built by the Department is encountered, all of which pavement offers the traveling public an excellent highway from Keyport to Red Bank. The elimination of two overhead bridges over the Pennsylvania Railroad at Middletown is noteworthy. Instead of crossing the railroad and then recrossing, making a right angle turn in between; by following the northerly side of the railroad over new alignment at this point, a very bad condition is overcome.

Entering Red Bank over the Shrewsbury River Bridge a noticeable improvement in the condition of this as well as other bridges on the highway routes is noted. The bridge is free from obstructions, and the floor planking securely fastened, so that one can go over the bridge without delay or annoyance. Considerable work has been done on this bridge in order to make it safe for loads as posted on the bridge approaches. The work of the Highway Department on highway bridges cannot be too highly commended. The majority of the bridges which were turned over to the Highway Department were in a deplorable and unsafe condition. In a good many cases in the last year or two, emergency repairs have had to be made after inspection by the forces of the Highway Department, in order to make the bridges safe temporarily, for traffic using them.

The paving under construction through Red Bank, on the Highway System, this year will add another important link to this route, connecting up with the bituminous concrete pavement on a concrete base between Red Bank and Eatontown, completed last year. With such good paving conditions one is able to observe and enjoy the beautiful scenery and fine homes through these shore resorts.

The construction under the reimbursement act of paving from Eatontown to West Long Branch, Shadow Lawn, Roseld Avenue Job, Borough of Avon, and Sea Girt Avenue in Manasquan, this year, will eliminate some of the worst of this shore highway from the intensive maintenance which is necessary for a secondary type of pavement under heavy traffic, as far south as the Manasquan



# The Highwayman of New Jersey



The sporty looking gent at the left is Construction Inspector "Cap" (Ralph) Caprio. He is not playing golf, but "inspecting" on Route 4, Section 14.

The fellow who is all "set up" at the right is E. T. McNierney, with his assistant William Harris. They are checking up work on construction on Route 4.

River. In crossing the Manasquan River Bridge the fill which is gradually growing longer from the Point Pleasant side towards the middle of the river will be noticed.

Funds are not at present available for the reconstruction of this important bridge, but in order to take advantage of the earth being excavated from the inland waterways canal at West Point Pleasant, the Highway Department contracted for the fill which will greatly shorten the length of this bridge when it is reconstructed. This far-sighted policy will, in later years, eliminate costly maintenance of a very long bridge, as the fill will almost cut down the length of this bridge one-half. Route No. 4, through Ocean County is at present practically all gravel, which has given the Department a serious job to maintain under the heavy shore traffic, particularly through the towns. Ocean County entered into an agreement to construct ten miles, under the reimbursement plan, of the 55 miles of State Highway in the county. This ten miles was distributed over the County, in order to take care of the sections most difficult to maintain and consequently the poorest riding. Beginning in Point Pleasant one mile is being constructed of Richmond Avenue. From Laurelton to and through Lakewood to a point approximately one mile south of Lakewood a concrete pavement is being constructed totaling 6.5 miles (funds for part of this improvement are being provided by Lakewood Township). The contractor, Ralph Earle, who has the contract for Section 14 and 15 from Laurelton through Lakewood, has started his work at the Laurelton end and at the time of writing had approximately one-half mile of pavement laid, including curve and intersection at Laurelton.

We came across Contractor Earle's mixing plant tied up on account of a broken cable on the mixer. If all such contingencies could be eliminated from construction work, life would be rosier for our friends the contractors. It hurts right in the pocket-book to look at a line of trucks tied up for a couple of hours.

1.5 miles of concrete pavement will be built through Toms River. As in Lakewood this pavement will go through part of the business district of this town, eliminating a very bad section of the highway from our problem of intensive maintenance. One mile of concrete pavement is to be constructed in Barnegat and one-half mile in Tuckerton. In both of these cases the pavement will go through the business section of the town.

Shortly after crossing the Ocean County line we come to the Job's Creek bridge which has been a source of danger for years on this much traveled route, due to the fact that a one way bridge existed right at a very sharp turn. This very bad point has been eliminated, however, by filling across the marsh at this point on an easier curve, and then constructing a new bridge of ample width.

Proceeding south through New Gretna we encountered another very bad corner which has been eased. In the photograph below the stakes and the telephone poles show how much the corner was "eased".

The construction of the Mullica River Section has been a God-send to travelers over this route. A very narrow road existed previously over these meadows which had settled for years, leaving a very bad road with inadequate bridges. Before this section was reconstructed test borings were taken, in order to determine the nature of the foundation for the new road, and it was found that from twenty to thirty feet of mud existed, before a solid sand foundation could be reached. It was decided to use the old roadway and fill out to the required width on either side and keep filling until the material had penetrated to a stable foundation. This plan was followed out, using gravel pits on each end of the job to supply the material for the fill. While some settlement is still taking place, the fill is being made to bring the road back to grade practically as fast as it settles. This will continue until the road reaches its final settlement.

# of New Jersey



Above, at left, is the part of the old road on Route 4, Section 9. Diverging to the right is the roughly excavated road bed for the new highway, which when completed will mark a great improvement in this section.

Another of the photos herewith shows the new bridge constructed by Atlantic and Burlington Counties before this route was taken over by the Department. The old bridge can be observed at the left in the foreground, at the south side of the Mullica River. Section 9 of this route is now under contract, with C. H. Earle doing the work. Grading operations are well under way. This section will eliminate the alignment, which is far from direct, through Port Republic and thence back through Smithville. The new route runs in a straight line between Mullica River and Smithville.

The picture taken at the "monument" shows another bad turn that is being eliminated by the new alignment, as the new right of way passes in back of this monument and thence crosses the old road again at a point further on, continuing over practically all new alignment to Smithville. A narrow township road existed part-way between the Mullica River and Smithville and the new highway at some places follows the old road.

The photograph at the top of page 9 shows a point at which the new rough graded roadway crosses the narrow old road, in order to secure better alignment than the old road offered. In addition to providing a much shorter

distance and better alignment for the State Highway, the farmers through this district will be able to market their products more easily over the new highway.

This section joining with the recently completed section from Smithville to Absecon, a warrenite bitulithic pavement on macadam base going by the famous and beautiful Sea View Gold Club grounds. At Absecon the route intersects the Philadelphia-Atlantic City road, which Route No. 3.

## Cost of Removing Grade Crossings

In 1921 only 399 railroad crossings were eliminated, the average cost being \$50,000. Records of the U. S. Bureau of Standards show that there are 251,939 railroad crossings in the United States.—*Colorado Highways*.

From the above figures one is enabled to readily see that it will require an enormous amount of work, money and considerable time to completely eliminate grade crossings.

Meanwhile the public must be educated to think and act "safety first" until such a time may come, when all "crossings" have been made "fool proof" by means of elimination.

Too much importance cannot be attached to this nationwide Safety First campaign.



(Left) You can see—if your eyes are good—the new bridge constructed by Atlantic and Burlington Counties before the Route was taken over by the Department. (Mullica River section.) At right, the new Red Bank-Eatonstown Road, completed this year.



Above, (left) shows how the Department is trying to improve bad curves. The stake at the left of the telephone pole, shows how much the corner was "eased" (Route 4, New Gretna.) (right) Another bad turn that is being eliminated, the new alignment going back of the monument (Route 4, south of Mullica River.)

### Stop Grade Crossing Accidents is Slogan

*President Harding Indorses American Railway Association's Plan—Says Grade Crossings Should be Abolished; But as this is Impossible Now, Nation Should Unite Behind Next Best Solution.  
—1,072 Lives Lost Last Year.*

American Automobile Association clubs in all parts of the United States are co-operating to the extent of their ability in the observance of the campaign against grade-crossing accidents, which is to continue four months under the auspices of the American Railway Association. The campaign is in line with the propaganda issued by the A. A. A. ever since its inception, and every club in the association is posting placards and otherwise warning its members to "cross crossings cautiously."

President Harding has given his hearty endorsement to the plan, in a letter written to the railway association. In this letter the President calls attention to the fact that "The ideal solution is elimination of grade crossings, to which all possible energy and means should be unceasingly directed," but in the absence of ability to do this, he praises the efforts of the railway association as the next best plan. The President's letter follows:

"The complete scope of such an effort would mean the saving of thousands of lives, the prevention of many more thousands of injuries, and incidentally, the prevention of a great property loss."

#### *Ultimate Aim Should Be Absolute Elimination of Grade Crossings*

"Of course, the ideal solution is the elimination of grade crossings, to which all possible energy and means should be unceasingly directed. But the extent of our country and its railroad mileage makes apparent that not for many years of utmost effort could this be effected.

"There should be constant pressure for elimination of the danger spots, particularly in the more populous areas pending which there is need for just the kind of preventative effort that your association is planning.

"Among these measures the most effective would seem to be to arouse in the minds of drivers a sense of their personal responsibilities. When thoughtlessness is allowed to usurp the place of vigilance, as too often happens, the scene is set for tragedy. Reminders and still more reminders of the need for caution at railway crossings are needed.

"Surely the effort you are undertaking is appealing and it ought to have the most generous and general support."

#### *Three People Killed at Grade Crossings EVERY DAY*

Statistics shows that 1,072 persons were killed and 4,818 injured in 1921 by grade-crossing accidents, a great majority of the cases involving automobiles. These figures were compiled by the Interstate Commerce Commission and are authentic. This commission's figures show that such accidents have shown an alarming increase during the past few years with 1921 as the high mark.

The safety section of the American Railway Association started in about a year ago to teach safety-first rules among its employees and the success attained by this effort has led to the broader campaign.

The American Automobile Association has been preaching carefulness at grade crossings ever since it was organized and is still preaching that slogan today. Officials of the A. A. A. have promised the warmest kind of support for the railway association's campaign, and it is hoped to effect changes in present practices that will result in the ultimate saving of thousands of lives.—*American Motorist.*

#### **Avoidance of Accidents**

Division Engineer James Kinkead of the Pennsylvania Railroad sent the State Highway Engineer a pamphlet showing the fatalities on the right of way of railroads of the country, largely due to carelessness. Mr. Kinkead said in sending this pamphlet to us, "I thought you might be interested in seeing what the terrible record is for trespassing on railroads." A few extracts from this pamphlet

will be of interest to readers of the HIGHWAYMAN, because it will call our attention to the accidents resulting in serious injury or fatalities which occur on the highways of the country. There is not available statistical machinery for securing and compiling the information on the subject of accidents upon the highways, so we will have to use the railroad information as a basis for our thought.

"During the past ten years, 84,000 people have been killed and injured in this country while trespassing or walking on railroad tracks and bridges and unlawfully riding on freight and passenger trains."

"Nine thousand (9,000) of this great army of killed and injured were children under 14 years of age; 12,000 were between 14 and 21 years; 9,000 were hoboes and tramps and the remaining 53,000 were useful members of society, including clerks, industrial workers and professional people, the majority of whom lived in the communities in which they met death or injury."

The pamphlet sums up the railroad accident situation by a list of Don'ts. All of these relate to pedestrians, except one, which we are quoting herewith and which applies to drivers of vehicles as well as pedestrians.

#### *"Stop, Look and Listen"*

"Before crossing tracks at crossings, Stop, Look and Listen to see if a train is coming, and after a train has passed make sure no other trains are approaching in either direction."

One of the most serious phases of the danger upon highways in our opinion is the use of the edge or center of the pavement at night by pedestrians. For the benefit of those who have not driven a car at night we will say that while automobiles are usually equipped with strong headlights, it is often very difficult to see a pedestrian until the machine is too close to offer an opportunity to the driver to turn out. This is particularly true in foggy or rainy weather, or when there is traffic in both directions upon the road. The lights from machines going in the opposite direction blinds the driver to some extent, even though the candle power of the lights and the diffusing lens may comply with the law, to such an extent that pedestrians are in danger if they are not constantly on the alert to avoid the oncoming vehicles. Motorists have been urged to observe every precaution from a dozen different sources of information and educational propaganda, so we need not go into the details here.

#### *Directions For Crossing a Railroad Track*

When approaching a grade-crossing of a steam or electric railroad slow up, so that you can see far enough in either direction down the railroad, to insure your crossing the same before a train or car could possibly reach you. It would be the part of wisdom to change to second speed in order to avoid the possibility of stalling on the tracks, at points where a long sight down the railroad in either direction is impossible. A flagman or gateman at a railroad crossing is a measure of protection to you, but don't rely entirely upon them. Check up the flagman or gateman before crossing. You might be able to prove that the gateman was at fault, but the chances are greatly against you doing so in this world.

#### *To Pedestrians*

Don't try to maintain your right of way on the road either day or night in the face of an on-coming automobile. Remember you have a second to gain and only your life to lose. The driver may be as determined to have his way as you are, in which case, something has got to "bust". The driver at night may not see you and even though he does see you in the daytime you will have more chance of getting satisfaction from a "road-hog" if you take his number, than if you let him run over you.

Don't ever cross the street without looking in both directions. Don't walk suddenly out from behind a vehicle stopped along the street or road. Don't allow your children to play in the street, if it is in any way possible to avoid it. If it is necessary for them to go upon the street use every means possible to impress upon their minds the danger they will encounter from traffic and how to avoid same.



In front of Seaview Golf Club, near Atlantic City, (Route 4)

### Warrenite—Bitulithic Pavements Have Stood Up Under Heavy Traffic For 15 Years

The test of the paving is in the riding—and the cost of upkeep.

Upon either of these points we invite your critical investigation.

Some of the oldest paved roads in New Jersey were laid under the Warren patents.

Many of these have been in constant use under heavy traffic for fifteen years. They are still in excellent condition.

*"The Best Road You Can Buy Is the Cheapest in the End."*

**Warren Bros. Company**

District Office 50 Church Street, New York City, N. Y.

### The Delaware River Quarry & Construction Company

### Largest Producers of Crushed Trap Rock in New Jersey

ESTABLISHED THIRTY YEARS

Main Office: 21 Bridge Street, Lambertville, N. J.

Branch Office  
National Bank Bldg., New Brunswick, N. J.



# The Highwayman of New Jersey



Benson Street, Glen Ridge, New Jersey, "Tarvia-E" 1919 and 1920

## Are your roads in rags, or well dressed?

"The apparel oft proclaims the man."

And Shakespeare might well have added, "The road oft proclaims the town;" for good roads are the one unfailing sign of a progressive community.

Tarvia Roads are not only good roads—they are also *economical roads*.

Whether used for new construction or for resurfacing worn-out macadam, the moderate cost of Tarvia-macadam means a substantial saving in first cost, while the saving in maintenance expense, compared with other types of permanent construction, is proportionately even greater.

Tarvia roads are dustless and mudless in

all kinds of weather. They are waterproof and so are unaffected by the biting frosts of winter. The melting snow finds them smooth and firm—all ready for the hard summer traffic.

For your every road problem—new construction, repairs and maintenance—there is a grade of Tarvia and a Tarvia treatment that provides an economical and satisfactory solution.

Hundreds of progressive communities in every part of the country use Tarvia for all their road work. They have found that Tarvia roads "make the going easy" for both the travelling public and the taxpayer.

Tarvia is a coal tar preparation made in a number of grades to meet varying road conditions. It is the most popular road material in America and has solved the problem of low cost, traffic-proof roads and pavements for hundreds of towns throughout the country.

# Tarvia

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Repair and Maintenance*

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## Which Car Is Best?

You have your opinion.

But what car isn't BETTER on a Concrete Road?

The car with the highest gas mileage has *higher* mileage on Concrete.

The car with the quickest "pick-up," picks up *quicker* on firm, unyielding Concrete.

The least expensive car to drive is *less* expensive on Concrete. And the gritty Concrete service is skid-proof. Motorists know these are facts—and motorists, if they insist, can get the kind of roads they want.

*Our Booklet R-3 tells other interesting things about Concrete Roads. Write for your copy.*

**PORTLAND CEMENT ASSOCIATION**

347 Madison Avenue, New York

*A National Organization to Improve and Extend the Uses of Concrete*

Offices in 23 Other Cities



## GLUTRIN

### Four Reasons Why All Gravel Roads Should Be Treated With Glutrin

First: Glutrinized gravel roads are hard all the year round.

Second: Glutrinized roads shed water—and for that reason they do not rut up during the winter and Spring.

Third: Glutrin is the best binder yet discovered for gravel stone, sand-clay, or slag or earth roads.

And finally: Glutrin is not only the best binder, but by far the most economical.

#### What Local Authorities Think of Glutrin Road Binder:

*Taken from the Daily Pioneer of Bridgeton, N. J., Tuesday, February 14, 1922*

##### "SHOWS VALUE."

"Last fall the state highway department caused west Commerce street to be flushed with glutrin, an oil-like preparation which has for its object the laying of the dust and preventing the gravel on the roads from being cut up with the traffic. The glutrin application also has had the effect of giving the street a surface which turned much of the water, and the results show a very much improved condition this winter. While most of the gravel streets are soft with mud, west Commerce street is comparatively firm and free from mud, and much smoother in consequence. The experiment would seem to indicate that the glutrin application greatly improves dirt roads."

Glutrin has been manufactured by us in our own plants for over 15 years. We have our own tank car line in which to deliver the product. The material used in New Jersey was applied by Mr. M. R. Young, Trenton, N. J., with pressure distributors especially built to handle this product.

Send us your name, and let us put you next to Glutrin!

**Robeson Process Company**  
Fifth Avenue Building, 200 Fifth Avenue, New York



(Courtesy Portland Cement Association)

### When Vulcan Made 'em, They Lasted Forever

Vulcan was the blacksmith of the Gods on high Olympus.

The things he forged in his mighty smithy lasted forever.

Neither time nor tempest, age nor rust, could

destroy their everlastingness!

In that, they were similar to roads built of "Vulcanite"—the cement that is made in our giant plant at Warren Co., N. J., with its capacity of 2,000,000 barrels a year.

*"Let's get together and talk Cement!"*

**VULCANITE PORTLAND CEMENT CO.**

PHILADELPHIA

BOSTON

NEW YORK



## "EDISON"

The Word that means "Cement Satisfaction"

Why not put your cement troubles up to Edison?  
Why fret and worry and lose money on slow deliveries, when we can ship your order the same day as received?  
Do you realize that Edison Cement is produced right here in New Jersey; and that we can ship 150 carloads a day?

*"Edison service Cement when you want it!"*

**EDISON PORTLAND CEMENT CO.**

NEW YORK

BOSTON

PHILADELPHIA

PLANT: NEW VILLAGE, N. J.





Designed and copyrighted, 1922 by the Sales Printing Corporation, New York  
 You have seen this poster before. Look at it again—closely.  
 Imagine yourself in the driver's place—IT HAPPENS THREE  
 TIMES EVERY DAY!  
 "Ca'anny" at the Crossing!

### Making Road Crossings Foolproof

All over the United States posters are displayed in conspicuous places pleading for carefulness on the roads with reference to the crossing of steam railroad tracks. A "Campaign" is on in an effort to make the crossings less deadly. It would seem from the wide spread of these effectively designed pictorial appeals that everybody in this country by now has had the danger of grade crossings brought directly home and the need of care emphasized to him. Yet the death toll continues.

It is necessary to make the crossings foolproof. The only way to do that is to make it impossible to cross them, and the only way, in turn to do that is to carry the roads over or under the tracks. It will take a long time to make these changes throughout the crowded part of the country, but meanwhile every grade crossing in the United States, especially in the neighborhood of cities, should be "protected." There should be some way of reminding the heedless ones, and the forgetful ones, and the reckless ones, that death lies ahead.

If those killed at the grade crossings were only the drivers who take the chances there would not be the same feeling of urgency for the correction of these conditions. But for every driver killed there are two or three or half a dozen innocent ones sacrificed through his folly. It is for the sake of these innocent passengers in motor cars,

sometimes the families of the drivers, that the demand arises for speeding up the work of undercutting and overpassing, and meanwhile for the erection of gates and the establishment of flagmen by night and day at all the frequented crossings.

The poster appeal for the people to be careful is good as far as it goes. It cannot be too widely distributed or too conspicuously displayed. But it is not enough. The grade crossings must be made foolproof, and it is gratifying to note that such a step is now provided for in Federal Aid legislation.—*Highway News Digest.*

### To the Flivver Boob

Your flivver boob may be a rube,  
 Or he may be from the city,  
 From fields of hay, or from Broadway,  
 He's the same guy—more's the pity!

He'll never stop for a traffic cop;  
 He thinks it's very witty  
 To "step on the gas" other Boobs to pass;  
 To "make" a close crossing, is gritty.  
 To "save" some kid, by a swerve and a skid,  
 He describes as "very pretty"—  
 Oh, we wish him well; may he stall in —!  
 Is the hope of our little ditty! —F. F. R.



First Observant Fisherman: "Say, Bill, what's the difference between a motor truck an' a tractor?"  
 Second Observant Fisherman: "That's easy—the tractor plows up the FIELDS."



Route No. 1 Rocking Burston

The Highwayman Is Out  
 For More and Better Roads  
 in New Jersey

August, 1922  
 Vol. II  
 No. 1

## Detour But Follow the Arrow!

Below, you will find the photographs of the members of the State Highway Commission, and of the State Highway Engineer.

In former issues of the HIGHWAYMAN you have read the story of each of these men. None of them were born "with a silver spoon." Several of them, through their early days, had as hard a struggle as any man on the Highway Department forces.

Study the faces below, and you will find a wide difference in the features. But one thing they have in common shows plainly enough DETERMINATION.

You don't have to be an expert character reader to get that—any school-boy could tell it. Every one of these men, fairly early in life, acquired a *purpose*—a fixed, fairly definite goal which he aimed at (just as you, perhaps have done.)

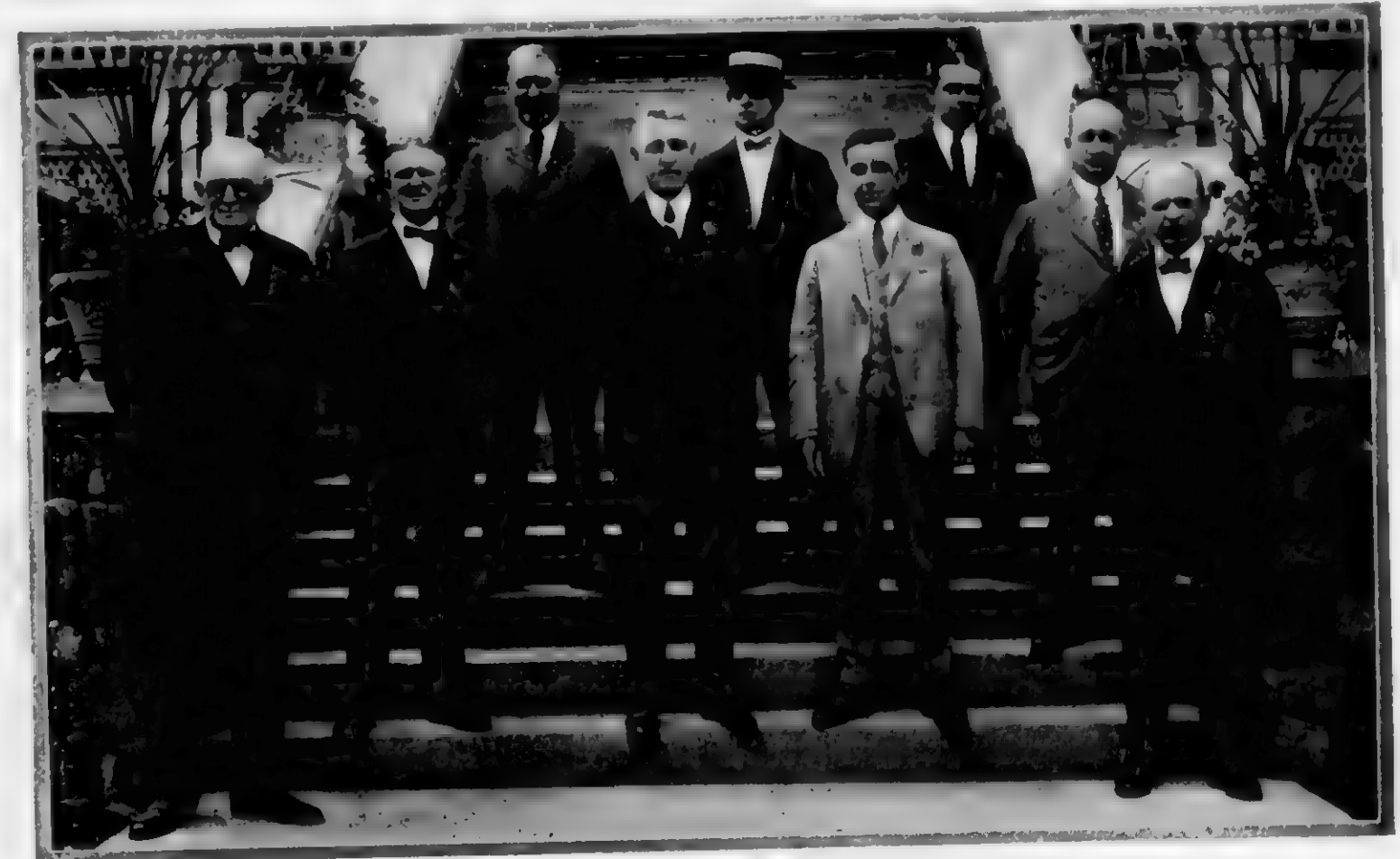
Then the time came when the road he wanted to travel, was blocked. The word "DETOUR" stared him in the face. The main road was closed. (That, also, happens to most of us.)

But being forced to "detour" never spells failure. If you know where you are going and follow the arrow!

If, when you find the easy main road blocked and a "detour" necessary, you do not have a definite goal—if you do not follow the arrow of a *fixed purpose*—you will soon find yourself wandering around aimlessly in the by-roads, getting nowhere.

Study the story of any successful man, and you will find that he did not have a paved Highway to Success. Often, he had to "detour". But—always he followed the arrow!

The detours did not keep him from arriving.



Back Row—left to right—Commissioners Whittemore, Paddock and Burton; State Highway Engineer Wasser  
 Front Row—Commissioners Doughty, Seabrook, Collins, Ferris and Duffy.

## The Highwayman

Published Monthly By The  
State Highway Department, at Trenton, N. J.  
The HIGHWAYMAN will be sent free upon application  
to any citizen of New Jersey who is interested in  
More and Better Roads For New Jersey.

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5th Vice President	WM. J. MCGOVERN, State Labor
6th Vice President	H. D. ROBBINS, Construction
Executive Secretary	EDWARD W. O'BRIEN

### Does the Highwayman Fill the Want

This is the twelfth monthly issue of the HIGHWAYMAN. We are anxious to know what the readers, including the Press and other interested parties, think of the one-year-old publication.

We earnestly solicit comments, in order to determine our policy regarding the continuance of a publication which is intended to keep the public informed regarding the activities of the Department and foster harmonious relations and efficiency of the personnel of the Department.

### U. S. to Lead the World in Superior Highways

Federal and State engineers are now mapping out a system of highways to serve the whole country and which will be far superior to any other in the world. The Federal Highway Act specifically requires that all Federal Aid be spent on a connected system of highways consisting of not more than 7 per cent of the road mileage in each State and that this system shall consist of interstate or primary roads and intercounty or secondary roads. Proposed systems have been received by the Bureau of Public Roads from all but eight States. They are plotted on a large map of the United States and carefully examined as to the coordination of systems of adjacent States and as to the coordination of systems of the whole country. Where co-ordination is not satisfactory conferences are held with all interested State highway officials and routes adjusted. Many States have already adjusted difficult problems with their neighbors. As an example, the system sent in by Nebraska showed a big gap in an important road along the Northern boundary. It was learned that South Dakota would follow with a system which would fit like pictures on toy blocks. Since the Federal Highway Act of last November became a law, only roads certain to be on the system have been approved for construction. It is estimated that the system will comprise 180,000 miles of road 60,000 of which is already constructed.—*Highway News Digest.*



Thomas J. George  
Supervisor of State Labor

To T. J. George belongs a big part of the credit for having put through so successfully the Budd Lake job which as you know was handled with state labor forces.

This job, of which we have shown several photographs, in the HIGHWAYMAN, has been a great credit to the Highway Department.

Mr. George got his education in the public schools of Newark, New Jersey, and upon completing his work there went as an apprentice with the firm of Van Deyne & Young, Surveyors. He worked with this firm for a period of six years. Mr. George then joined B. M. & J. F. Shanley Company, General Contractors, as superintendent. While with them he had charge of the job of changing over the tracks from Horse Car Railroad to Electric Railroad in Newark and Paterson. He also had charge of the construction of the Bloomfield and Montclair trolley lines, and of many miles of state aid roads in Monmouth, Middlesex, Morris and Sussex Counties, including Norwood Avenue on Route 4, Stockholm to Franklin on Route 8, the Freehold to Manalapan Road on Route 7, and Corlies Avenue, on Route 7.

Mr. George joined the forces of the State Highway Department in April, 1921, and was appointed acting supervisor of state labor in December, 1921, in which capacity he has been giving splendid service to the taxpayers of the state. He became Supervisor of State Labor on August 9, 1922.

### Advance Notice on State Highway Convention

The State Highway Commission at its meeting held on July 17th authorized the holding of the Third Annual Convention of the New Jersey State Highway Department. It is the purpose to hold this convention February 14th to 17th, 1923, at the Stacy-Trent Hotel, Trenton, New Jersey.

The Arrangements Committee has received suggestions from several sources that it arrange for exhibits for road materials and equipment companies. It is the Committee's desire to learn just what the attitude of the material men and equipment men is toward this matter of exhibiting at the Convention. The exhibits must, of course, be limited in scope by the fact that the exhibition space will be on the Ball Room floor, at the Stacy-Trent Hotel.

The Committee would appreciate an expression of opinion from the readers of THE HIGHWAYMAN concerning this matter of exhibits.

It is the purpose of the Committee to have the Annual Banquet on the night of Thursday, February 15th. Further details will be furnished later. Rest assured that it is the purpose of the Committee to avoid the last minute rush at the next Convention.

Feelers have already been put out for the men we want to maintain the usual high standard of papers presented.

Note the dates! February 14, 15, 16 and 17, 1923.



James Henry Litchfield

James Henry Litchfield, Construction Inspector with the Bridge Division of the State Highway Department, died in the Chapin Memorial Hospital, Springfield, Massachusetts, on July 16th, following an operation for duodenal ulcer.

Mr. Litchfield, who had been employed by the Bridge Division since April 1st, 1921, was born at Leominster, Mass., March 1st, 1889, and was graduated from Holden (Mass.) High School in 1906. Following a post graduate course, he entered Worcester Polytechnic Institute in 1907, where he pursued the course in Civil Engineering for two years. He then accepted a position as resident engineer on a hydro electric development for W. D. Thompson, Inc., of Worcester, Mass. In the summer of 1910 he was employed as resident engineer with Durkee, White and Towne, engineers of Springfield, Mass. In this capacity his duties included surveys for railroad locations and water supply systems. From 1912 to 1915 Mr. Litchfield was employed as an engineer in the office of the City Engineer, Westfield, Mass. From 1915 to 1918 he had charge of the engineering offices of O. E. Parks of Westfield.

In 1918 he accepted a position as resident engineer with H. F. Dunham, consulting engineer of New York, on a power development project at Newmarket, N. H. He relinquished this position in the fall of 1920 when he became identified with T. I. Ellis, Contractor, Providence, R. I., as office engineer and construction superintendent on concrete structures. Upon completion of his work with Mr. Ellis, he accepted the position as Bridge Construction Inspector with the State Highway Department. At the time of his death Mr. Litchfield was on a three months' leave of absence.

In the spring of 1911 he married Miss Viva J. Tucker of Russell, Mass., who survives him. Beside his widow, he leaves a mother and three sisters. At the funeral, which was held from the home of Mrs. Litchfield's parents in Russell, the sympathies of Mr. Vogel, Bridge Engineer, and the employees of the Bridge Division, were expressed by beautiful floral tributes. Burial was at Russell.

Although he made few intimate friends, the men who knew Jim Litchfield well, will feel his loss most keenly for he was a man of sterling character and high ideals.

Trenton, New Jersey.  
July 22, 1922.

NEW JERSEY HIGHWAYMAN:

Editor:—I desire to take this opportunity to express my sincere appreciation for the sympathy extended and for the beautiful floral offering from Mr. Vogel and the employees of the Bridge Division.

Sincerely,  
VIVA J. LITCHFIELD.

## NEW JERSEY STATE HIGHWAY DEPARTMENT

ADMINISTRATIVE  
THE STATE HIGHWAY COMMISSION  
and  
THOMAS I. WASSER, State Highway Engineer

### ADMINISTRATION

A. LEE GROVER, Secretary and Chief Clerk

M. L. HOWELL	Chief Auditor and Accountant
CHAS. FISHER	Assistant Chief Clerk
R. W. WILDBLOOD	Purchase Clerk
MISS GRACE WILLIAMSON	Chief File Clerk

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C. F. BIDWELL, Construction Engineer  
G. R. MOORE, Asst. Construction Engineer

R. A. MEERER	Right of Way Engineer
JOHN L. VOGEL	Bridge Engineer
THOMAS GEORGE	Supervisor of State Labor
C. A. BURN	Northern Division Engineer
H. D. ROBBINS	Central Division Engineer
J. A. WILLIAMS	Southern Division Engineer
L. E. HALL	Chief Draftsman

### PROJECTS DIVISION

EDWARD E. REED, Assistant State Highway Engineer  
A. D. BULLOCK, Projects Engineer  
H. C. SHINN, Engineer of Special Assignments

### MAINTENANCE DIVISION

ALEX W. MUIR, Superintendent of Maintenance  
F. D. WOODRUFF, Assistant Supt. of Maintenance  
I. M. STORR, Chief Inspector

### EQUIPMENT DIVISION

J. A. HAGIN, Superintendent of Plants and Equipment  
N. C. APPELGATE, Asst. Supt. of Plants and Equipment  
J. J. TYMAN, Asst. Supt. of Plants and Equipment  
F. M. DEVEREAUX, Asst. Supt. of Plants and Equipment

### TESTING LABORATORY

R. B. GAGE, Chemical Engineer

J. G. BRAGG, Senior Testing Engineer  
F. H. BAUMANN, Senior Testing Chemist

### A Modern Engine of Mercury

BY SAMUEL HOPKINS ADAMS

The first domesticated cow is credited with having been the engineer who laid out the first road. Not an ancient city in Europe but testifies, in the tangled intricacies of its streets, to the vagaries of that cow's descendants.

Men improved progressively upon the bovine methods of highway establishment until his chosen pathways were bedded in rock, lined with steel and patrolled by monsters that outsped the winds of heaven. With the railroads, said prideful man, had come the last word in the spread of highways. Then the automobile loomed up, and where this modern engine of mercury goes, roads unroll before it like the magic carpet before the feet of the djinn. From Greeland to Patagonia it imperatively demands passage-way to its unknown goal beyond the ridges. American-inspired associations in Japan, in Australia, in the Argentine, at the Cape of Good Hope preach the gospel of the wheel-bearing path to Everywhere.

Propaganda—this is pure propaganda—primarily in the interest of business, but by indirection, and more important, for that solidarity which binds communities together and dissolves barriers between Nations.

The history-old engineering which began with milk, ends with gasoline.—*Highway News Digest.*



# The Highwayman of New Jersey

Harry Clinton Shinn, Manager of Homestead Farms and Engineer of Special Assignments, is shown in the photograph above. He is a well-known figure in the highway construction industry in New Jersey.



**"H. C." Shinn, Manager of Homestead Farms and Engineer of Special Assignments**

Somewhere in the official records of Lakewood, New Jersey, you will find that "H. C." S. once stood for Harry Clinton Shinn—but that has long since been forgotten by everyone except those most directly interested. H. C., who is sometimes known as "Harry" admits on close examination that he was born in Lakewood, New Jersey. This fact alone should be sufficient proof of the high regard in which H. C. holds truth, the whole truth and nothing but the truth.

Harry started his engineering experience with the Lakewood Water, Light and Power Company, in 1905. Subsequent engagements in the engineering field found him in March, 1912, employed with the DuPont Powder Company, with which company he held a responsible position in the layout, arrangement and studies for extensive powder plant development, construction of railroad sidings, pipe lines, etc. Leaving the DuPont Powder Company he carried on private practice in Bernardsville, N. J. In 1918 he was appointed County Engineer of Ocean County. He resigned this position to become connected with the State

Highway Department. While with the Department he has held the position of Assistant Engineer, Assistant Division Engineer of the Central Division, Supervisor of State Labor, and Engineer of Special Assignments, which is his present position.

We nearly forgot to mention that "Harry" was at one time a successful farmer. We do not know who he does not mention this in his autobiography for we are sure he could make a success of anything that he tackled.

This is best exemplified by his recent agricultural achievements. With the aid of a "Planet Junior" No. 25, and Skinner overhead irrigation, he has succeeded in raising a wonderful vegetable garden. H. C. claims that the former machine almost surpasses the Puddle Jumper as a source of pleasure. The irrigation system is held largely responsible for the recent heavy rains. Besides being able to raise enough vegetables to supply Lakewood proper, he has raised four fine healthy hogs. Harry is a student of human nature and is the greatest little angler we know of. He is enthusiastic, full of pep and a fine fellow.

## Paving Inspection

The first requisite for proper relations between the engineer and the contractor is clearly worded specifications. Every clause should be expressed in good English. Specifications which need constant interpretation and frequent appeals by the inspector to the engineer cause delays, and therefore loss of money to the contractor.

### Co-operation Between Inspector and Foreman

The contractor's foreman or superintendent, to be of any use, must be a man who can overcome obstacles and meet emergencies as they arise. He, therefore, is likely to resent what he considers constant interference with his work by an inspector who is not only young, and inexperienced, but perhaps undiplomatic as well. On the other hand where the inspector's suggestions and orders are given in a sensible way and with a real desire for co-operation, they ought to be received in the right way, for the foreman or superintendent who engages in constant disputes with the inspector may be wholly unfitted to bring about the co-operation which the contractor desires with his customers. Of course there are contractors who do not read the specifications before they bid. In other words, they do not really know what is expected of them and only trouble can be expected from any such situation as this. But where the inspector takes the attitude that he is there not only to see that the job is done in accordance with the specifications, but to make the job go along quickly and smoothly, the relations between him and the contractor are bound to be harmonious, and without harmony no organization can possibly work as it ought.

### Inspector's Interpretation of Specifications

With regards to the inspector's interpretation of the specifications, it cannot be too strongly stated that all specifications must be interpreted with common sense. If he is supervising the laying of granite block pavement, he must realize that these blocks are not pieces of mosaic. To be unduly careful about the straightness of the rows, or the widths of the blocks in the rows or the wideness of the joints, and then not to see that the cement grout is properly mixed and placed is to show lack of knowledge as to where to make the contractor live up to a literal interpretation of the specifications.

This same idea applies to those above the inspector. If every time the engineer visits the job he talks about something that is wrong—especially if it is some small matter—and rarely says anything about what is right, he soon gets the reputation of being impractical, and he probably is. If that foreman or superintendent is worth anything at all, the job he is running is to him the greatest job there is, and to have someone find fault with some minor point discourages him and results in no good. Not that a man should be constantly praised, for that is surely not good, but a word of encouragement at times will often do more than fault finding to bring about a desire on the part of the contractor's foreman to do his best, which is surely what every engineer wishes. The contractor's superintendent or foreman should be led to look to the engineer as a man having superior knowledge along certain lines, and not simply as a kind of super-censor whose principal job is to find fault.—*Engineering and Contracting.*

## Building Better Bridges

### Bridge Foundations

The foundations of bridges are the most important part of the structure. They are the base upon which the bridge is built, and they must be able to support the weight of the bridge and the traffic that it carries. The foundations are usually made of concrete and are built into the ground. They are designed to be strong enough to withstand the forces of nature, such as floods and earthquakes, and to last for many years. The foundations are also designed to be able to support the weight of the bridge and the traffic that it carries. They are usually made of concrete and are built into the ground. They are designed to be strong enough to withstand the forces of nature, such as floods and earthquakes, and to last for many years. The foundations are also designed to be able to support the weight of the bridge and the traffic that it carries.

Several types of foundations are used in bridge construction, but the ordinary conditions can usually be met, either by a concrete spread footing on good firm soil or by the use of piles if the bearing power of the soil is inadequate to carry the load. In either case the footing course is carried well below the bed of the stream to prevent scour, and sometimes a cut-off wall on the stream side of the abutment is carried below the foundations proper as an additional protection. In the larger and more important structures, the bearing power is determined by borings taken at the site before the bridge is designed.

Cofferdams of wood or steel sheeting are driven around the foundations to support the adjoining earth, exclude the water and permit of pumping and excavating. Especial attention is required in the installation of coffer dams, in order that they may be as nearly water tight as possible, thus allowing the placing of concrete on a dry foundation bed. Cofferdams should also be built sufficiently large to allow for the building of concrete forms inside of them, thereby leaving a space for pumping between the forms and the sheeting. Extreme care should be exercised in the interior bracing, as the pressure of earth and water may cause the collapse of an improperly braced dam.



Driving sheeting for cofferdam at East Abutment, showing bracing piles before cutting off to given grade. (Bridge No. 84, Route 12, Section 1)

The foundations of bridges are the most important part of the structure. They are the base upon which the bridge is built, and they must be able to support the weight of the bridge and the traffic that it carries. The foundations are usually made of concrete and are built into the ground. They are designed to be strong enough to withstand the forces of nature, such as floods and earthquakes, and to last for many years. The foundations are also designed to be able to support the weight of the bridge and the traffic that it carries.

With a proper realization of the importance of bridge foundations and the care that has come in their construction, the bridges now being built by the State Highway Department should safely withstand the traffic demands of this generation as well as any flood conditions to which they may ever be subjected.

JAS. H. HYNES,  
Bridge Construction Inspector,  
N. J. State Highway Dept.

## Value of Federal Aid and Praise for Mr. MacDonald

To those who have doubted the tangible value of Federal Aid to States in highway construction, attention is called to the remarks of Secretary Wallace at a recent hearing before the House Roads Committee, and transmitted among other enclosures in this number of the Digest. The flat statement is made that Federal Aid investments have been returned already to the public, and Mr. Wallace explains why. One other point that came out in a spontaneous way was that the conduct of the Bureau of Public Roads under Mr. MacDonald's direction, has evoked less criticism than any other department of the government—a particularly gratifying statement to those engaged in highway work. Such testimony as Mr. Wallace gives furnishes a good support for the adoption of extended Federal aid programs and will aid State highway officials in organizing their departments upon a permanent basis.—*Highway News Digest.*



Cleaning up foundation prior to concreting, showing piles cut off to given grade (Bridge 84, Route 12, Section 1) (At right) driving sheeting with steam hammer for cofferdam at East Abutment (Bridge 88, Route 12, Section 1)

# The Highwayman of New Jersey

7



The Highway Department has needed such a building as the new service station at Fernwood. Being within three miles of the center of Trenton, the building is well located and it will help greatly in taking care of the rapidly increasing work of the Department.

The Highway Department was very fortunate in securing for a nominal amount, 25 acres of land within three miles of the center of Trenton, just outside the city limits, in what is called Ewing Township. It was there decided to build this service station, the location of the property being between a hard surface road in front and a branch of the Reading Railroad in the rear, which enabled us to run a railroad siding into the property. This siding was constructed in a manner which permitted a drop track at the end, which facilitates unloading of machinery without having to block up.

The drainage of the property is taken care of by the method employed by the United States Army at their cantonments. Water supply was secured by driving a well, installing a pumping outfit, with a tank holding 100,000 gallons.

The service station main building is 100x406 ft. These dimensions and building were decided upon after our Department heads made several inspection trips looking over stations and garages within a 100 mile radius of Trenton. Of all locations we visited, we were unable to see anything that might meet the requirements of the Department. We did note, however, all the particular features of these stations and garages that we visited, and after designing our own building, we incorporated therein the features that we noted in these other stations.

The building is principally of steel and glass, with brick curtain walls, and a Monitor light shaft running through the center of the roof, which guarantees maximum light at all times at every corner of the building. The building is divided by a fire wall set back 240 feet from the front. The front is divided into the following departments:

The foreman's office of glass partitions with maple flooring and finished in oak to match the office furniture, about 40 ft. x 40 ft. All records of the Equipment Division will be kept there. Adjoining this is the wash room, toilets, showers and rest room, which is 40 ft. x 40 ft. Adjoining this room is the electric, magneto and repair department, which is about 20 ft. x 30 ft. Next is the carpenter and body shop where all wagon, wheelwright work, and all work pertaining to wood work on equipment is taken care of. This room is fire-proof, and is 30 ft. x 30 ft.

Next in line is the paint shop, also fire-proof, size 20 ft. x 30 ft., with all modern painter's equipment. Next to this is the welding and blacksmith shop, size 20 ft. x 30 ft. This shop is equipped with the latest type of acetylene and electric welding equipment, as well as blacksmith tools such as forges, machine hammers and blowers. Next to this is the stock room 79 ft. x 30 ft., with a mezzanine of the same size. There is a small hand elevator in the stock room to take care of the heavy stock to be placed on the mezzanine floor. There are approximately 7,000 feet of stock bins erected in the lower stock room for small parts for daily use.

The main floor of the building is paved with Kreolite Grooved Block on a concrete foundation. This eliminates fatigue on the men that are required to work around the equipment. On the opposite side of the building we have

a machine shop; next to this we have the unit shops, first the transmission department, then the differential department, and then a department to care for motors entirely. Next to the motor department we have what we call a special Ford department, where we rebuild and repair Fords. At the further end of the building we have a live tank where, as soon as a unit is taken from the machine, it is submerged and all foreign particles removed therefrom, so that when the mechanics are required to work on same, it can be done with the least possible inconvenience, thereby assuring our men of being able to work on automobiles with clean shirts and collars.

We have also arranged for a metal department where all radiators are rebuilt and repaired, where metal equipment, such as metal bodies, metal cabs, etc., can be taken care of, designed, and built.

In the centre between these two layouts, we have a space of 40 feet clear for trucks and cars under repair, and is within easy reach of all the other departments.

Beyond the fire wall, we have a boiler room, coal bins, etc., the boiler room being equipped with three boilers and a stack of sufficient draft, same being 63 feet in height. We have also provision for hot water while the boilers are being used for heating only. We have a space beyond this fire wall 160 ft. x 100 ft. where cars, when completely overhauled, are kept and can be assigned to a job at a moment's notice, with the satisfaction that same are in first class condition.

We do not attempt to take care of dead storage in this building and are arranging to build an additional set of storage sheds for housing. The location of the building on the property is about 600 feet back from the front, and will be connected to the main highway with a concrete road. The interior of the building is painted white, except the exposed metal steel girders, which are painted dark green. The general surroundings of the whole structure are such as to produce efficient and satisfactory work from the men there employed.

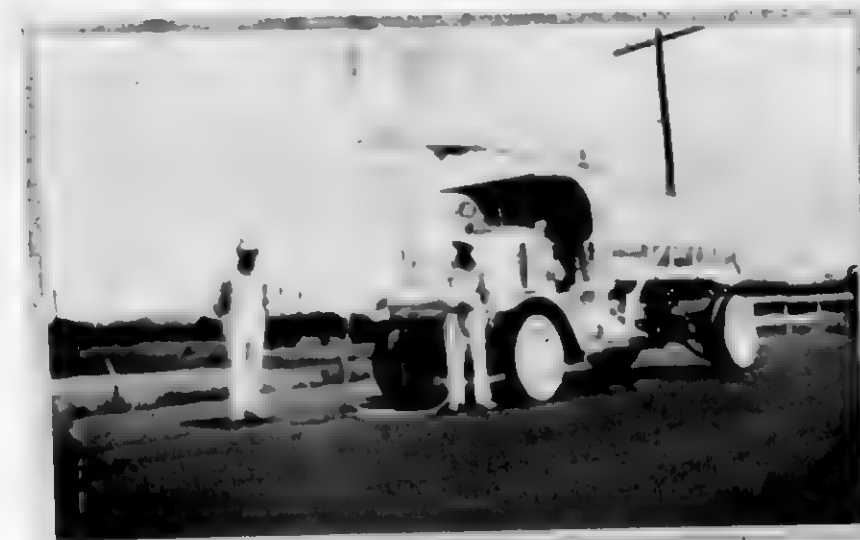
## What Are You Worth?

According to scientific investigation, the ingredients of a man are as follows:

Fat enough for seven bars of soap.  
Iron enough for medium-sized nail.  
Sugar enough to fill a shaker.  
Lime enough to whitewash a chicken-coop.  
Phosphorus enough to make 2,200 match-tips.  
Magnesium enough for a dose of magnesia.  
Potassium enough to explode a toy cannon.  
Sulphur enough to rid a dog of fleas.  
Water enough for one Saturday night bath.

This whole collection is worth 98 cents, and that in a day when things are three times as high as they used to be.

The only additional ingredient is GUMPTION. According to the amount of that there is mixed in with the other things, you are worth 20c an hour, or \$20,000 a year.



The Highwayman has never done any "whitewashing" but we're glad to "show up" driver "Gas" Hoffman, and Hose Operators "Mickey" Dilts and Bill Lawler, of the Highway Department whitewashing crew (Route 4, south of Woodbridge).

## Along Your Highways

Under this heading is presented each month a description of the conditions along one or more of the main roads of the state. If you drive a car, you will be interested in following this series.

### Route No. 4

Starting at Rahway thence through Woodbridge to Perth Amboy, the paving is in fair conditions. Constant watchfulness on the part of the Maintenance Division is necessary, however, in order to hold this route in shape to carry the heavy shore traffic. The pavement continues in fair condition through Perth Amboy.

Between Woodbridge and Perth Amboy the white-washing outfit was encountered. "Gas" Hoffman, the driver of the big Mack truck was telephoning from a nearby station. Photograph herewith shows the big Mack with its tank and swining arms, which allows the hose free play, in order that the operators, "Mickey" Dilts and "Bill" Lawler may coat the guard rail, fences and poles, with whitewash.

The accompanying picture shows the whitewash on the bottom of the poles to a height of about five feet. Every motorist knows the value of this kind of white marking, for night travel.

The blue pole banding through Perth Amboy, is of distinct advantage to the traveler in guiding him through this city, where many turns are necessary in order to reach the approach to the Raritan River Bridge.

The Perth Amboy-South Amboy bridge, spanning the Raritan River, is a pile trestle frame structure, very difficult and costly to maintain. Sections of this bridge have been carried away at times by ice and severe river conditions, necessitating hurried emergency repairs. The draw span has reached a point where maintenance under present traffic conditions is impractical, it being inadequate to safely carry the loads permitted by law to travel the roads. The Highway Department has, therefore, made provision for the construction of a new bridge at a point west of the old bridge and paralleling same, where a shorter bridge can be built of modern design to provide for the heavy traffic of today.

This, of course, will entail the expenditure of a huge amount of money, estimated roughly at \$4,000,000. The Bridge Division of the Highway Department has investigated conditions at this point, in order to determine with some degree of certainty, the most economical type of construction. 24 pilings have been driven and a load of 1019 tons of pig iron has been imposed upon them in order that the type of construction may be determined. It is interesting to note that bed rock is encountered at an average distance of approximately 115 feet below the river high water mark. The reconstruction of this bridge will add greatly to the convenience, comfort and safety of the large volume of traffic using Route 4. From a point where the south approach to the new bridge will begin, through South

Amboy, a new concrete pavement recently built, greatly improves conditions through that city.

After leaving South Amboy a brick pavement which is a little rough, is encountered, continuing to Morgan; at which point a bituminous concrete pavement on a macadam base in very fair condition continues to Keyport. A recently completed bituminous concrete pavement through Keyport connecting with the concrete and bituminous concrete pavements built several years ago by Monmouth County, carries the traffic to a point known as the Betsy Ross Farm, three or four miles south of Keyport, where a new concrete pavement built by the Department is encountered, all of which pavement offers the traveling public an excellent highway from Keyport to Red Bank. The elimination of two overhead bridges over the Pennsylvania Railroad at Middletown is noteworthy. Instead of crossing the railroad and then recrossing, making a right angle turn in between; by following the northerly side of the railroad over new alignment at this point, a very bad condition is overcome.

Entering Red Bank over the Shrewsbury River Bridge a noticeable improvement in the condition of this as well as other bridges on the highway routes is noted. The bridge is free from obstructions, and the floor planking securely fastened, so that one can go over the bridge without delay or annoyance. Considerable work has been done on this bridge in order to make it safe for loads as posted on the bridge approaches. The work of the Highway Department on highway bridges cannot be too highly commended. The majority of the bridges which were turned over to the Highway Department were in a deplorable and unsafe condition. In a good many cases in the last year or two, emergency repairs have had to be made after inspection by the forces of the Highway Department, in order to make the bridges safe temporarily, for traffic using them.

The paving under construction through Red Bank, on the Highway System, this year will add another important link to this route, connecting up with the bituminous concrete pavement on a concrete base between Red Bank and Eatontown, completed last year. With such good paving conditions one is able to observe and enjoy the beautiful scenery and fine homes through these shore resorts.

The construction under the reimbursement act of paving from Eatontown to West Long Branch, Shadow Lawn, Roseld Avenue Job, Borough of Avon, and Sea Girt Avenue in Manasquan, this year, will eliminate some of the worst of this shore highway from the intensive maintenance which is necessary for a secondary type of pavement under heavy traffic, as far south as the Manasquan



# The Highwayman of New Jersey



The sporty looking gent at the left is Construction Inspector "Cap" (Ralph) Caprio. He is not playing wolf, but "inspecting" on Route 4, Section 14.

The fellow who is all "set up" at the right is E. T. McNierney, with his assistant William Harris. They are checking up work on construction on Route 4.

River. In crossing the Manasquan River Bridge the fill which is gradually growing longer from the Point Pleasant side towards the middle of the river will be noticed.

Funds are not at present available for the reconstruction of this important bridge, but in order to take advantage of the earth being excavated from the inland waterways canal at West Point Pleasant, the Highway Department contracted for the fill which will greatly shorten the length of this bridge when it is reconstructed. This far-sighted policy will, in later years, eliminate costly maintenance of a very long bridge, as the fill will almost cut down the length of this bridge one-half. Route No. 4, through Ocean County is at present practically all gravel, which has given the Department a serious job to maintain under the heavy shore traffic, particularly through the towns. Ocean County entered into an agreement to construct ten miles, under the reimbursement plan, of the 55 miles of State Highway in the county. This ten miles was distributed over the County, in order to take care of the sections most difficult to maintain and consequently the poorest riding. Beginning in Point Pleasant one mile is being constructed of Richmond Avenue. From Laurelton to and through Lakewood to a point approximately one mile south of Lakewood a concrete pavement is being constructed totaling 6.5 miles (funds for part of this improvement are being provided by Lakewood Township). The contractor, Ralph Earle, who has the contract for Section 14 and 15 from Laurelton through Lakewood, has started his work at the Laurelton end and at the time of writing had approximately one-half mile of pavement laid, including curve and intersection at Laurelton.

We came across Contractor Earle's mixing plant tied up on account of a broken cable on the mixer. If all such contingencies could be eliminated from construction work, life would be rosier for our friends the contractors. It hurts right in the pocket-book to look at a line of trucks tied up for a couple of hours.

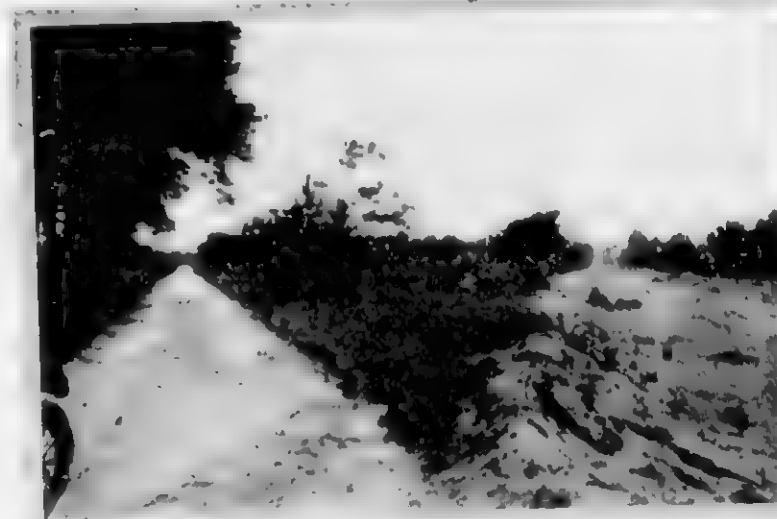
1.5 miles of concrete pavement will be built through Toms River. As in Lakewood this pavement will go through part of the business district of this town, eliminating a very bad section of the highway from our problem of intensive maintenance. One mile of concrete pavement is to be constructed in Barnegat and one-half mile in Tuckerton. In both of these cases the pavement will go through the business section of the town.

Shortly after crossing the Ocean County line we come to the Job's Creek bridge which has been a source of danger for years on this much traveled route, due to the fact that a one way bridge existed right at a very sharp turn. This very bad point has been eliminated, however, by filling across the marsh at this point on an easier curve, and then constructing a new bridge of ample width.

Proceeding south through New Gretna we encountered another very bad corner which has been eased. In the photograph below the stakes and the telephone poles show how much the corner was "eased".

The construction of the Mullica River Section has been a God-send to travelers over this route. A very narrow road existed previously over these meadows which had settled for years, leaving a very bad road with inadequate bridges. Before this section was reconstructed test borings were taken, in order to determine the nature of the foundation for the new road, and it was found that from twenty to thirty feet of mud existed, before a solid sand foundation could be reached. It was decided to use the old roadway and fill out to the required width on either side and keep filling until the material had penetrated to a stable foundation. This plan was followed out, using gravel pits on each end of the job to supply the material for the fill. While some settlement is still taking place, the fill is being made to bring the road back to grade practically as fast as it settles. This will continue until the road reaches its final settlement.

# of New Jersey



Above, at left, is the part of the old road on Route 4, Section 9. Diverging to the right is the roughly excavated road bed for the new highway, which when completed will mark a great improvement in this section.

Another of the photos herewith shows the new bridge constructed by Atlantic and Burlington Counties before this route was taken over by the Department. The old bridge can be observed at the left in the foreground, at the south side of the Mullica River. Section 9 of this route is now under contract, with C. H. Earle doing the work. Grading operations are well under way. This section will eliminate the alignment, which is far from direct, through Port Republic and thence back through Smithville. The new route runs in a straight line between Mullica River and Smithville.

The picture taken at the "monument" shows another bad turn that is being eliminated by the new alignment, as the new right of way passes in back of this monument and thence crosses the old road again at a point further on, continuing over practically all new alignment to Smithville. A narrow township road existed part-way between the Mullica River and Smithville and the new highway at some places follows the old road.

The photograph at the top of page 9 shows a point at which the new rough graded roadway crosses the narrow old road, in order to secure better alignment than the old road offered. In addition to providing a much shorter

distance and better alignment for the State Highway, the farmers through this district will be able to market their products more easily over the new highway.

This section joining with the recently completed section from Smithville to Absecon, a warrenite bitulphic pavement on macadam base going by the famous and beautiful Sea View Gold Club grounds. At Absecon the route intersects the Philadelphia-Atlantic City road, which Route No. 3.

## Cost of Removing Grade Crossings

In 1921 only 399 railroad crossings were eliminated, the average cost being \$50,000. Records of the U. S. Bureau of Standards show that there are 251,939 railroad crossings in the United States.—*Colorado Highways*.

From the above figures one is enabled to readily see that it will require an enormous amount of work, money and considerable time to completely eliminate grade crossings.

Meanwhile the public must be educated to think and act "safety first" until such a time may come, when all "crossings" have been made "fool proof" by means of elimination.

Too much importance cannot be attached to this nationwide Safety First campaign.



(Left) You can see—if your eyes are good—the new bridge constructed by Atlantic and Burlington Counties before the Route was taken over by the Department. (Mullica River section.) At right, the new Red Bank-Eatontown Road, completed this year.



Above, (left) shows how the Department is trying to improve bad curves. The stake at the left of the telephone pole, shows how much the corner was "eased" (Route 4, New Gretna.) (right) Another bad turn that is being eliminated, the new alignment going back of the monument (Route 4, south of Mullica River.)

## Stop Grade Crossing Accidents is Slogan

*President Harding Indorses American Railway Association's Plan—Says Grade Crossings Should be Abolished; But as this is Impossible Now, Nation Should Unite Behind Next Best Solution.  
—1,072 Lives Lost Last Year.*

American Automobile Association clubs in all parts of the United States are co-operating to the extent of their ability in the observance of the campaign against grade-crossing accidents, which is to continue four months under the auspices of the American Railway Association. The campaign is in line with the propaganda issued by the A. A. A. ever since its inception, and every club in the association is posting placards and otherwise warning its members to "cross crossings cautiously."

President Harding has given his hearty endorsement to the plan, in a letter written to the railway association. In this letter the President calls attention to the fact that "The ideal solution is elimination of grade crossings, to which all possible energy and means should be unceasingly directed," but in the absence of ability to do this, he praises the efforts of the railway association as the next best plan. The President's letter follows:

"The complete scope of such an effort would mean the saving of thousands of lives, the prevention of many more thousands of injuries, and incidentally, the prevention of a great property loss."

### *Ultimate Aim Should Be Absolute Elimination of Grade Crossings*

"Of course, the ideal solution is the elimination of grade crossings, to which all possible energy and means should be unceasingly directed. But the extent of our country and its railroad mileage makes apparent that not for many years of utmost effort could this be effected.

"There should be constant pressure for elimination of the danger spots, particularly in the more populous areas pending which there is need for just the kind of preventative effort that your association is planning.

"Among these measures the most effective would seem to be to arouse in the minds of drivers a sense of their personal responsibilities. When thoughtlessness is allowed to usurp the place of vigilance, as too often happens, the scene is set for tragedy. Reminders and still more reminders of the need for caution at railway crossings are needed.

"Surely the effort you are undertaking is appealing and it ought to have the most generous and general support."

### *Three People Killed at Grade Crossings EVERY DAY*

Statistics shows that 1,072 persons were killed and 4,818 injured in 1921 by grade-crossing accidents, a great majority of the cases involving automobiles. These figures were compiled by the Interstate Commerce Commission and are authentic. This commission's figures show that such accidents have shown an alarming increase during the past few years with 1921 as the high mark.

The safety section of the American Railway Association started in about a year ago to teach safety-first rules among its employees and the success attained by this effort has led to the broader campaign.

The American Automobile Association has been preaching carefulness at grade crossings ever since it was organized and is still preaching that slogan today. Officials of the A. A. A. have promised the warmest kind of support for the railway association's campaign, and it is hoped to effect changes in present practices that will result in the ultimate saving of thousands of lives.—*American Motorist.*

### **Avoidance of Accidents**

Division Engineer James Kinkead of the Pennsylvania Railroad sent the State Highway Engineer a pamphlet showing the fatalities on the right of way of railroads of the country, largely due to carelessness. Mr. Kinkead said in sending this pamphlet to us, "I thought you might be interested in seeing what the terrible record is for trespassing on railroads." A few extracts from this pamphlet

will be of interest to readers of the HIGHWAYMAN, because it will call our attention to the accidents resulting in serious injury or fatalities which occur on the highways of the country. There is not available statistical machinery for securing and compiling the information on the subject of accidents upon the highways, so we will have to use the railroad information as a basis for our thought.

"During the past ten years, 84,000 people have been killed and injured in this country while trespassing or walking on railroad tracks and bridges and unlawfully riding on freight and passenger trains."

"Nine thousand (9,000) of this great army of killed and injured were children under 14 years of age; 12,000 were between 14 and 21 years; 9,000 were hoboes and tramps and the remaining 54,000 were useful members of society, including clerks, industrial workers and professional people, the majority of whom lived in the communities in which they met death or injury."

The pamphlet sums up the railroad accident situation by a list of Don'ts. All of these relate to pedestrians, except one, which we are quoting herewith and which applies to drivers of vehicles as well as pedestrians.

### *"Stop, Look and Listen"*

"Before crossing tracks at crossings, Stop, Look and Listen to see if a train is coming, and after a train has passed make sure no other trains are approaching in either direction."

One of the most serious phases of the danger upon highways in our opinion is the use of the edge or center of the pavement at night by pedestrians. For the benefit of those who have not driven a car at night we will say that while automobiles are usually equipped with strong headlights, it is often very difficult to see a pedestrian until the machine is too close to offer an opportunity to the driver to turn out. This is particularly true in foggy or rainy weather, or when there is traffic in both directions upon the road. The lights from machines going in the opposite direction blinds the driver to some extent, even though the candle power of the lights and the diffusing lens may comply with the law, to such an extent that pedestrians are in danger if they are not constantly on the alert to avoid the oncoming vehicles. Motorists have been urged to observe every precaution from a dozen different sources of information and educational propaganda, so we need not go into the details here.

### *Directions For Crossing a Railroad Track*

When approaching a grade-crossing of a steam or electric railroad slow up, so that you can see far enough in either direction down the railroad, to insure your crossing the same before a train or car could possibly reach you. It would be the part of wisdom to change to second speed in order to avoid the possibility of stalling on the tracks, at points where a long sight down the railroad in either direction is impossible. A flagman or gateman at a railroad crossing is a measure of protection to you, but don't rely entirely upon them. Check up the flagman or gateman before crossing. You might be able to prove that the gateman was at fault, but the chances are greatly against you doing so in this world.

### *To Pedestrians*

Don't try to maintain your right of way on the road either day or night in the face of an on-coming automobile. Remember you have a second to gain and only your life to lose. The driver may be as determined to have his way as you are, in which case, something has got to "bust". The driver at night may not see you and even though he does see you in the daytime you will have more chance of getting satisfaction from a "road-hog" if you take his number, than if you let him run over you.

Don't ever cross the street without looking in both directions. Don't walk suddenly out from behind a vehicle stopped along the street or road. Don't allow your children to play in the street, if it is in any way possible to avoid it. If it is necessary for them to go upon the street use every means possible to impress upon their minds the danger they will encounter from traffic and how to avoid same.



In front of Seaview Golf Club, near Atlantic City, (Route 4)

## Warrenite—Bitulithic Pavements Have Stood Up Under Heavy Traffic For 15 Years

The test of the paving is in the riding—and the cost of upkeep. Upon either of these points we invite your critical investigation. Some of the oldest paved roads in New Jersey were laid under the Warren patents. Many of these have been in constant use under heavy traffic for fifteen years. They are still in excellent condition.

*"The Best Road You Can Buy Is the Cheapest in the End."*

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Benson Street, Glen Ridge, New Jersey, "Tarvia-B" 1919 and 1920

## Are your roads in rags, or well dressed?

"The apparel oft proclaims the man."

And Shakespeare might well have added, "The road oft proclaims the town;" for good roads are the one unfailing sign of a progressive community.

Tarvia Roads are not only good roads—they are also *economical roads*.

Whether used for new construction or for resurfacing worn-out macadam, the moderate cost of Tarvia-macadam means a substantial saving in first cost, while the saving in maintenance expense, compared with other types of permanent construction, is proportionately even greater.

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Hundreds of progressive communities in every part of the country use Tarvia for all their road work. They have found that Tarvia roads "make the going easy" for both the travelling public and the taxpayer.

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## Which Car Is Best?

You have your opinion.

But what car isn't **BETTER** on a Concrete Road?

The car with the highest gas mileage has *higher* mileage on Concrete.

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Our Booklet R-3 tells other interesting things about Concrete Roads. Write for your copy.

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## GLUTRIN

### Four Reasons Why All Gravel Roads Should Be Treated With Glutrin

First: Glutrinized gravel roads are hard all the year round.

Second: Glutrinized roads shed water—and for that reason they do not rut up during the winter and Spring.

Third: Glutrin is the best binder yet discovered for gravel stone, sand-clay, or slag or earth roads.

And finally: Glutrin is not only the best binder, but by far the most economical.

#### What Local Authorities Think of Glutrin Road Binder:

*Taken from the Daily Pioneer of Bridgeton, N. J., Tuesday, February 14, 1922*

##### "SHOWS VALUE"

"Last fall the state highway department caused west Commerce street to be flushed with glutrin, an oil-like preparation which has for its object the laying of the dust and preventing the gravel on the roads from being cut up with the traffic. The glutrin application also has had the effect of giving the street a surface which turned much of the water, and the results show a very much improved condition this winter. While most of the gravel streets are soft with mud, west Commerce street is comparatively firm and free from mud, and much smoother in consequence. The experiment would seem to indicate that the glutrin application greatly improves dirt roads."

Glutrin has been manufactured by us in our own plants for over 15 years. We have our own tank car line in which to deliver the product. The material used in New Jersey was applied by Mr. M. R. Young, Trenton, N. J., with pressure distributors especially built to handle this product.

Send us your name, and let us put you next to Glutrin!

**Robeson Process Company**  
Fifth Avenue Building, 200 Fifth Avenue, New York



(Courtesy Portland Cement Association)

### When Vulcan Made 'em, They Lasted Forever

Vulcan was the blacksmith of the Gods on high Olympus.

The things he forged in his mighty smithy lasted forever.

Neither time nor tempest, age nor rust, could

destroy their everlastingness!

In that, they were similar to roads built of "Vulcanite"—the cement that is made in our giant plant at Warren Co., N. J., with its capacity of 2,000,000 barrels a year.

*"Let's get together and talk Cement!"*

**VULCANITE PORTLAND CEMENT CO.**

PHILADELPHIA

BOSTON

NEW YORK



## "EDISON"

The Word that means "Cement Satisfaction"

Why not put your cement troubles up to Edison?  
Why fret and worry and lose money on slow deliveries, when we can ship your order the same day as received?  
Do you realize that Edison Cement is produced right here in New Jersey; and that we can ship 150 carloads a day?

*"Edison service Cement when you want it!"*

**EDISON PORTLAND CEMENT CO.**

NEW YORK

BOSTON

PHILADELPHIA

PLANT: NEW VILLAGE, N. J.





Designed and copyrighted, 1922 by the Sales Printing Corporation, New York.  
You have seen this poster before. Look at it again—closely.  
Imagine yourself in the driver's place—IT HAPPENS THREE TIMES EVERY DAY!  
"Ca canny" at the Crossing!

### Making Road Crossings Foolproof

All over the United States posters are displayed in conspicuous places pleading for carefulness on the roads with reference to the crossing of steam railroad tracks. A "Campaign" is on in an effort to make the crossings less deadly. It would seem from the wide spread of these effectively designed pictorial appeals that everybody in this country by now has had the danger of grade crossings brought directly home and the need of care emphasized to him. Yet the death toll continues.

It is necessary to make the crossings foolproof. The only way to do that is to make it impossible to cross them, and the only way, in turn to do that is to carry the roads over or under the tracks. It will take a long time to make these changes throughout the crowded part of the country, but meanwhile every grade crossing in the United States, especially in the neighborhood of cities, should be "protected." There should be some way of reminding the heedless ones, and the forgetful ones, and the reckless ones, that death lies ahead.

If those killed at the grade crossings were only the drivers who take the chances there would not be the same feeling of urgency for the correction of these conditions. But for every driver killed there are two or three or half a dozen innocent ones sacrificed through his folly. It is for the sake of these innocent passengers in motor cars,

sometimes the families of the drivers, that the demand arises for speeding up the work of undercutting and overpassing, and meanwhile for the erection of gates and the establishment of flagmen by night and day at all the frequented crossings.

The poster appeal for the people to be careful is good as far as it goes. It cannot be too widely distributed or too conspicuously displayed. But it is not enough. The grade crossings must be made foolproof, and it is gratifying to note that such a step is now provided for in Federal Aid legislation.—*Highway News Digest*.

### To the Flivver Boob

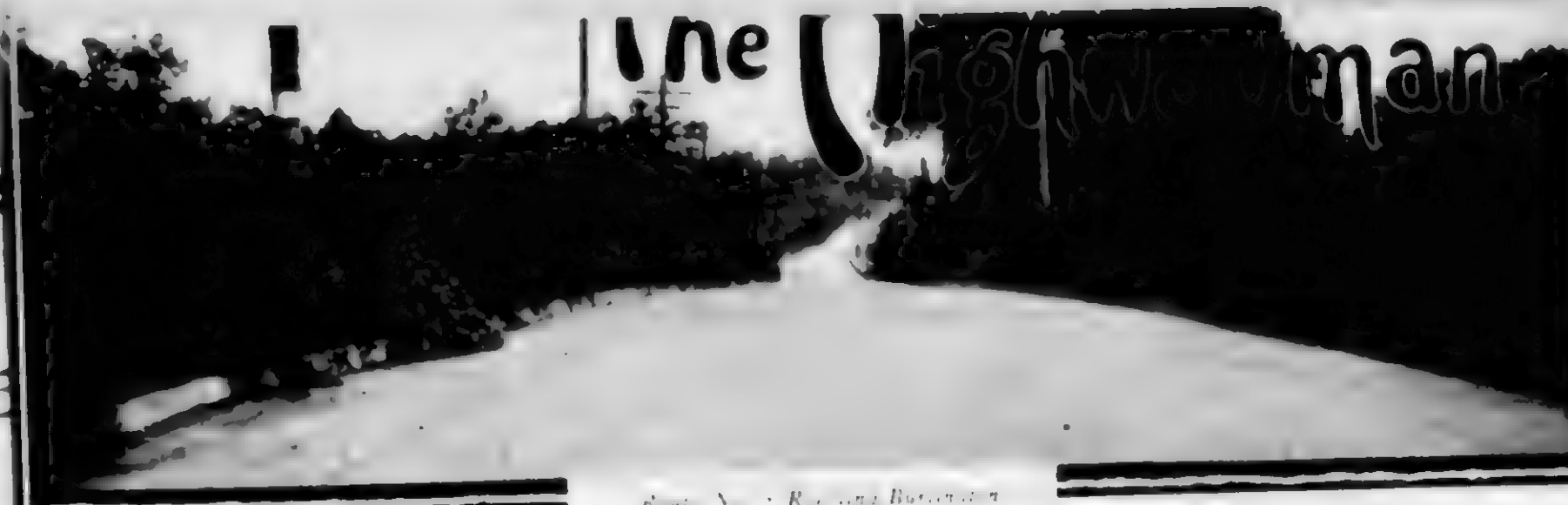
Your flivver boob may be a rube,  
Or he may be from the city,  
From fields of hay, or from Broadway,  
He's the same guy—more's the pity!

He'll never stop for a traffic cop;  
He thinks it's very witty  
To "step on the gas" other Boobs to pass;  
To "make" a close crossing, is gritty.  
To "save" some kid, by a swerve and a skid,  
He describes as "very pretty"—  
Oh, we wish him well; may he stall in —!  
Is the hope of our little ditty! —F. F. R.



First Observant Fisherman: "Say, Bill, what's the difference between a motor truck and a tractor?"  
Second Observant Fisherman: "That's easy—the tractor plows up the FIELDS."

AFTER CARTOON  
BY RENSE  
N.Y. KODAK TELESCOPE



August  
1922

Road Builders' Supplement

Vol. II  
No. 1



"Center Joint" type of construction, showing re-inforcing fabric in place (in foreground); and placing concrete over fabric. (Budd Lake, Route 5)

### Note

The papers presented at the recent Convention of the New Jersey Highway Association, and the discussions following them, are such a valuable contribution to the progress of road-building that it has been decided to publish them in full with as many as possible of the charts and illustrations used. (It has not been possible to include all of these, however, so there are occasional references in the text, to photographs and charts which have not been reproduced).

Our aim is to publish one or two of the Convention papers, with the discussion thereon, each month. We suggest that these be carefully filed, so that the reader may keep the complete set, which will make a very valuable addition to his road-building library.

This month we are printing "Merits of Bar Reinforcement for Concrete Pavements", by W. S. Edge, Concrete Steel Company, and the discussion thereon at the convention; also "The Proper Weight and Methods to Use to Secure the Desired Results with Sheet Fabric Reinforcement for Concrete Pavements", by W. C. Kuhn, American Steel and Wire Co., and the discussion thereon at the convention, and "Contract News" prepared to August 7, 1922.

Next month there will be published "The Proper Treatment of Posts for Guard Rails", by Edward T. Paddock, Carbolineum Wood Preserving Company, and the discussion thereon at the convention; also "The Advantages and Objections of a Sheet Asphalt Pavement With and Without a Binder Course", by Abram Swan, City Engineer, Trenton, New Jersey, and the discussion thereon at the convention.

The addition of reinforcement would permit of reducing the thickness of the concrete base by at least an inch and effect a saving in the cost of the road. At present day prices the saving as compared with one inch of concrete would amount to 15 to 25 cents a square yard depending on the weight of the steel 56 pounds per 100 sq. ft. or lighter.





Placing the Freshly Mixed Concrete on the Reinforcing

## Discussion of Mr. Kuhn's Paper

By Harry D. Beaton—National Steel Fabric Co.

In discussing Mr. Kuhn's paper let me amplify briefly the history he has given of the use of reinforcement.

By 1914 the concrete pavement was generally recognized as one of the durable pavements that would withstand heavy traffic. Its use was rapidly increasing. Even before then, however, far-sighted engineers had become aware that no known pavement that could be economically constructed over long periods of time could possibly endure the geometric increase in traffic, both in volume and weight, that was occurring. Something had to be done. Engineering Principles offered the suggestion: Why not steel reinforcement? The idea was scientifically sound, as Mr. Kuhn has proven, but its general adoption was impeded by the from Missouri mental attitude, by the penny-wise financial policy, by the clamor of conflicting claims of material interests, and by the natural reluctance of road builders to be bothered by new devices. Stronger than all these was the impelling need created by the traffic situation. State after State viewed with alarm the deterioration of its pavements—the loss in invested capital was unpleasantly obvious to the tax-payer. The use of reinforcement, spread in growing ratio to the results noted, until now Pennsylvania requires its altogether, New York almost entirely, North Carolina very largely in a comprehensive road building program, and New Jersey and other progressive States to a considerable extent. It has stood the test—roads built with reinforcement endure, with less maintenance than roads without it. It reduces the ultimate, or real cost of the road.

One other fact about reinforcement has been proved by use; it pays to use heavier material than was at first anticipated. Pennsylvania has even gone up to sixty-five (65) pounds. A comparison of pavements reinforced with weight from thirty-five to sixty pounds built and used under similar conditions shows a better present condition and lower total maintenance cost as the weight of reinforcement has increased. The Engineering News Record of January 12, telling what 1921 developed in Paved Road Design, says: "An increase of the weight of the steel was observable in all states where reinforcing is general."

The ideal condition to be met, that is, on stable soil,

would be to have sufficient reinforcement to offset temperature stresses,—for longer slabs, but that is now economically impracticable. We approach it as a constant under variable conditions of soil, climate, traffic and finance. What the engineers want to know is exactly what a given amount of reinforcement will do for a certain thickness of slab under certain conditions.

To the number of reasons that Mr. Kuhn gives for the use of reinforcement, I would add that the use of it prevents blow-ups; and prevents one part of the slab riding above the other at cracks, causing surface unevenness. Surface unevenness gives a jolting ride, and causes damage by impact. I agree from the higher tensile strength of wires and greater superficial area for bond strength, that wires should be allowed a preferential, based on their increased tensile and bond strength.

I agree with the 56 pound weight per 100 square feet and where economic conditions justify I might even suggest a slightly heavier material. I believe, too, that all concrete bases should be reinforced. I have noted asphaltic pavements whose surface was spoiled by cracking at the base at regular intervals through contraction and these could have been prevented by reinforcement, which would have obliterated the larger cracks.

In specifications I agree with Mr. Kuhn's ratio of about five or six transversely to one longitudinally of the pavement, if the slab is full width. But where the slabs are from nine to twelve feet in width, experience has shown that the lightly reinforced slabs do not crack longitudinally; under these conditions it is our transverse cracks that are troublesome.

I would, therefore, advocate two layers of reinforcement, with the bulk of metal placed longitudinally in order that the length of slab might be increased and to take care of the contraction cracks.

In conclusion, let me emphasize the thought, that experience has fully demonstrated that the weight of steel fabric now being most popularly used—that is approximately 56 pounds per 100 square feet—is the most economical from the standpoint of the original cost of the pavement, as well as the ultimate cost; that is, this amount will give the greatest return for the money expended and this is the ultimate to which we all aim.



Fabricated bar type of reinforcement in place (Dunellen, Route 9)

Showing method of laying concrete road in two sections, with header curb adjacent to trolley tracks.

## General Discussion of Mr. Kuhn's Paper

COL. WHITEMORE: You all doubtless know of the widespread use of wire as reinforcing in glass in large window areas. Some of the large steamship terminals on the Hudson River at Hoboken opposite New York have a great many thousand feet of reinforced glass in windows 12 feet square, and to my knowledge none of those panes of glass have been taken out and replaced since I put them in, in the early part of 1900, and in some cases the glass has cracked into thousands of pieces but the wire still holds them to exclude wind and water. Wire reinforcing in concrete, I take from the speakers' papers, has very largely the function of holding the concrete together due to its tendency to spread by any changes in temperature and since this is an exceedingly important subject, we would be very glad to hear questions on these papers at this time.

MR. SPARKS: I understood Mr. Beaton to say in one case where cracks occurred under an asphalt road with a concrete base that if the base had been reinforced, this would have eased the cracking or the cracking would not have occurred at all.

COL. WHITEMORE: The crack might have occurred, but it would not have materially spread. It would have been held together by the wire.

MR. BEATON: Right.

MR. SPARKS: Do you know positively that the crack would not have occurred if the wire had been in it?

MR. BEATON: We have found by experience that if there is wire in it the cracks have not occurred. In asphaltic concrete pavements, there are numerous cases where if reinforcement had been used in the base or the pavement in question, it would have prevented certain cracks appearing on the surface. If reinforcement is good for a concrete wearing surface, it certainly can be advantageously used in a base under an asphaltic pavement.

MR. SPARKS: Does it apply especially to wearing surfaces? I believe they have changed the transverse joints from 80 to 40 feet because it was found that the old idea of placing transverse joints still applies.

MR. BEATON: Pennsylvania, in 1921, I think, placed their transverse joints about 100 feet apart up to 200 feet. They were less in some places where the mixer stopped. I do not think they had any more serious cracks in 1921 than when they put the joints 64 feet apart.

MR. BURN: I would like to ask Mr. Kuhn which he considers better, the practice of placing wire fabric on the bottom and pulling it up through the concrete or placing a layer of concrete about 2 inches deep and then laying the fabric on it?

MR. KUHN: By all means strike off the concrete before you finish the leveling and place the reinforcing material. You never know, when pulling up through the concrete, exactly where it is. You do know exactly where it is the other way.

MR. BURN: That was the method used on our Budd Lake job—striking off the concrete.

MR. KUHN: I know of one case where instead of pulling it up through the concrete, the men got tired and laid it on the subgrade and forgot it. In that case it was a pure waste of wire as it did not do any good. First strike off your concrete and then place the reinforcing material.

MR. BURN: From observation I believe that is the common practice and not laying the wire on the bottom and attempting to pull it through.

MR. ALDRICH: Do you know of any experimental results as to placing reinforcement near the top or near the bottom?

MR. KUHN: Personally I do not know of any such tests made. There are many theories about what happens to concrete slabs when they heave, but as the ground beneath your slab is usually of a cool nature, it is natural to assume that the heaving action occurs to your slab more when it freezes and is more or less uniform. That is borne out by trolley rails on ties above the surface of the ground where they leave a space of a quarter of an inch for contraction and expansion and fasten with bolts. If we put the rails beneath a brick or Belgian block pavement we can weld the joints together, which would be an absolutely rigid connection. The rails on State Street of this city are laid in that manner showing that the heat does not penetrate below the slab. After the slab has heaved due to freezing there comes a thaw and the edges of the pavement are apt to sink before the middle. In that case the middle is supported and as the two sides expand the slab cracks. The compressive strength of concrete is high but the tensile strength is low.



Beginning the Laying of Concrete on the Brick Tavern-Perryville Job (Route 9, Sec. 2)

Mr. ALDRICH: The effect of the frost is realized. The ground thaws down for a few inches and becomes soft. Then you may get a cold night or two or three cold days and the ground which has thawed and become full of water will freeze and expand. In that case you would have your expansion near the edge of the pavement and you would need your steel near the bottom.

Mr. KUHN: I differ with you. Two-thirds of this thawed surface becomes soft and sinks half an inch and when this freezes it is not going to affect the edge of the slab.

Mr. ALDRICH: I meant to show the different theories. There should be some experimental sections laid with the reinforcing in the top and also in the bottom so as to get practical results.

Col. HOWARD: This question has been gone into for 20 years, as to where the reinforcing is needed, whether it should be 2 in. from the top or 2 in. from the bottom. Engineering practice and better judgment decree that it shall be 2 in. from the top. The old Clinton Wire Cloth Company, originators of wire cloth fabric, found that out in southern California. The Southern Pacific Railroad Company have a number of oil wells. At certain times of the year they would have an excess quantity of oil and had to store that oil somehow. They scraped holes in the ground but lost a considerable amount of oil by seepage with that method. They tried ordinary concrete but that cracked all to pieces and the result was a failure. They tried using mesh both from the top and bottom and found when they used  $1\frac{1}{2}$  in. mesh with a 4 in. slab of concrete just below the top of the surface of the concrete these cracks were not found. There were some hair-line cracks on top of the concrete but nothing serious. They only used 20-22 pound mesh. This showed that the better place to put your mesh was on the top below the surface. It also showed the advantage of mesh over bar.

Mr. BURN: We had a piece of road constructed near Glen Gardner. We used reinforcement 25 lbs. per 100 square feet 2 in. from the top. Only one crack appeared a short time ago. The mix was 1-2-3 and 6 in. concrete.

Mr. BRAGG: In line with the question relative to preventing cracks in the base by Mr. Sparks and the proper weight to use, I will say that at the last convention of the American Association of State Highway Officials, the office of the Bureau of Public Roads presented figures to show that in order to absolutely prevent cracking of the concrete in pavements it would be necessary to use 1,230 lbs. per 100 square feet instead of 56. I believe the theory and accepted idea is that this reinforcement can prevent cracks from opening up rather than to prevent these cracks entirely. I would like to ask Mr. Kuhn if he does not feel that in a good many cases, by this method of laying fabric that in a good many cases, by this method of laying fabric by placing it upon a 2 in. layer of reinforcement due to the fact that the concrete may lie there until it is pretty thoroughly dried out and more or less disintegrated before the fabric is placed.

Mr. KUHN: In my opinion that can only happen possibly through drying out after being spread to grade of the surface area of the first layer of concrete before putting on the reinforcement. If it is put down in sheets, the

time of the interval between striking off the concrete and laying the reinforcement is only a couple of minutes and there is no chance for drying out. You waste that much time in shifting the boom or chute on the mixer. If you spread an area of 15 or 20 feet square and then go back and place reinforcement over that area of either fabric or bars, the first portion is going to be somewhat dried up.

Mr. BRAGG: I had in mind the delay in getting the material to the mixer. It is necessary to shut down the mixer and sometimes you have a portion of your fabric covered and the other half uncovered. It is good practice to throw that material off the sub-grade but I do not think it is done. What do your specifications call for when you come to the end of a slab?

Mr. KUHN: The specifications call for finishing that slab. You call for finishing and putting in an expansion joint rather than taking a chance on getting a proper bond between the concrete going against your slab that was standing for some time. The same thing holds true with a layer of concrete on the ground.

Mr. BRAGG: I do not feel that in a good many cases the wearing strength and value of the concrete under a layer of fabric is destroyed.

Under certain atmospheric and ordinary workday conditions, we get a layer too thin to guarantee any sort of satisfactory concrete.

Mr. KUHN: You have in mind two layers of reinforcing, one layer 4 in. or 6 in. from the bottom. Then with two layers of reinforcement, it does not take long to spread the concrete and put the fabric on it.

Mr. SPEER: I would like to ask if you have had any experience in having the wire leave a void after the finishing machine has gone over the top layer. Whether the finishing machine when going over and tamping, does not have a tendency to drive the wire down which springs back and leaves a void.

Mr. KUHN: I could not say. I have had no practical experience in that connection. From my observation I would not imagine that you would get voids. There is a certain amount of spring in your reinforcement, too, which would take care of this. The tamping of the finishing machine would force down the fine as well as the coarse aggregate if a void should happen to occur.

Mr. COLLINS: Mr. Chairman, I would like to ask a question. I think the matter of monolithic construction in concrete road paving is a very important one. I have just built a section of road in Cranford which is taken care of by reinforcing. These slabs averaged 43 feet in length and 15 feet in width. Around the edge there is one  $\frac{5}{8}$  in. bar. Longitudinal bars run right through the joints. The principles of construction are the simplest imaginable. There is no question about monolithic construction being a very good one. The simplicity of the thing commends itself, as there is only one operation. I think the transverse joints are handled the same way. They are belted and the slab rolled and finished with one operation. After finishing there is a certain amount of finishing with a trowel. The best way to bind each slab around with heavy reinforcement. It has been very successful so far. Steel is  $\frac{5}{8}$  in. square.



Showing method of dumping the concrete from trucks on

the fabricated bar reinforcing (Dunellen, Route 9).

Col. WHITTEMORE: That reinforcement was bars of iron.

Mr. SHERBAUM: I believe there is a corrosive effect on steel after it is placed in the concrete. I would like to inquire whether the wire should be galvanized, and if not, whether there is any particular advantage in galvanized wire outside of the fact that it prevents corrosion before it is put in the pavement.

Mr. KUHN: We recommend ungalvanized wire. With

the galvanized wire the only real advantage is that a contractor might get a carload of material and let it lay around for six months and in the meantime it becomes badly corroded. A solid coat of rust on the wire does not affect the strength of the wire and materially increases the bond between the concrete and the steel. If it is a coarse scale, then the only bond is with the scale and not with the steel, and then the steel is not functioning. That is the only real benefit of galvanizing.

## Merits of Bar Reinforcement for Concrete Pavements

By W. S. Edge, Concrete Steel Co.

The subject of bar reinforcement for concrete pavements is one that has occupied a good deal of my time for the past three years. My company has been interested in the matter to the extent that they desired to find out whether concrete pavements needed reinforcement and if so what was the best type and the proper amount of steel to use for this purpose. In other words that was my job. Please do not think that I pose as an expert who will tell you the correct solution of this whole matter, but rather as one who is studying the great problem with a view of determining the best way of doing the job in the most economical manner possible.

My interests have been mainly directed heretofore along the lines of reinforced concrete building construction and similar heavy structures of reinforced concrete. In the early days of this industry there was a great deal of both woven and welded mesh used for reinforcement particularly for floor slabs where large areas were employed. We soon found, however, that a deformed bar reinforcement could be substituted with marked economy, particularly where heavy reinforcement was required. It has become almost the universal practice in the building world, therefore, to use deformed bars, and with the advent of more rigid specifications, various types of supporting and tying devices to space and support the steel have come into use. We still

use mesh in certain kinds of pipe and sewer work where it has advantages and also for light shrinkage reinforcement in buildings over so-called joist construction. It is also used in New York City in combination with skeleton steel construction and cinder concrete arches where an archaic building code allows this type of reinforcement certain advantages. With our past experience it was perfectly natural that we should expect to find an economy in the use of deformed bars in concrete road construction and such we have found to be usually the case where a reinforcement of 30 lbs. weight per 100 sq. ft. or greater is required. A deformed or plain steel bar is one of the very cheapest forms into which the metal can be rolled and that in a measure, explains its now well nigh universal use in reinforced concrete construction.

In the course of our experience with reinforced concrete buildings and other reinforced concrete structures we have developed numerous special devices which, in certain classes of work have effected marked economies in assembling steel reinforcement. In every case their use has produced a better and more workmanlike job and where there was much repetition of similar arrangement of reinforcing elements remarkable economies have been secured.

This is true of such structures as docks, piers and warehouses and also of pre-cast concrete piles.

We experimented with various methods of introducing





## Discussion of Mr. Edge's Paper

By Mr. C. A. Burn, Northern Division Engineer

MR. BURN: I have listened with considerable interest to Mr. Edge's paper, especially the part concerning bar reinforcement.

The State Labor Division used bar reinforcement in some work at Dunellen, N. J., on our Route No. 9. This work consisted of constructing approximately one mile of one course reinforced concrete pavement, 1-2-4 mix, eight (8 in.) thick, and was laid in two sections, one on either side of the trolley tracks. Each section was 12 feet wide, with an 8 inch header curb on the side adjoining the trolley tracks, cast integral with the pavement.

The reinforcement was of the double line type, made up of two mats of  $\frac{3}{8}$  in. deformed bar, 11 ft. x 12 ft. The main members in each mat ran longitudinal with the pavement, and were spaced 9 in. center to center on the bottom mat, and 18 in. center to center on the top mat. Transverse members in each mat were spaced 28 in. center to center. The mats were separated by six spacers which were made up of  $\frac{3}{8}$  in. bars bent in a rectangular shape, about 3 ft. 6 in. long and  $3\frac{3}{4}$  in. wide. Intersections were tied with No. 2 Havemeyer Bar Ties.

The main difficulty we encountered in handling this reinforcement was in getting it placed in the proper position in the pavement. First, we tried using about 12 common bricks, broken in half, and placed on the sub-grade, in order to keep the mats the required 2 in. from the bottom of the sub-grade, but this did not prove entirely satisfactory. Later, we used four 2 in. pipe.

The difficulty we found in using pipe was when we attempted to pull it from under the wet concrete, since we had to handle it by man power, as the concrete was mixed at a central plant and hauled directly to the work in one ton Ford trucks, equipped with Lee Dump Bodies.

We improvised a temporary platform, one end of which was rested on the trolley rail, and the other end on legs set in the sub-grade, and the trucks were backed on to this small platform and the concrete dumped directly upon the mats. The dumping of this heavy mass of concrete caused the mats to settle in the center, and spring up on the sides. In order to overcome this, great care was taken in dump-

ing the first load, and spreading same properly, working the concrete under the mat all the while. After spreading the first load carefully, it was an easy matter to spread the remaining three loads, the amount required to complete the section.

If some method can be devised to place the mats properly on the subgrade, and then retain them in position while the concrete is being deposited, I believe that bar reinforcement will work out much better than fabric reinforcement.

Mr. Edge, in his paper, mentions that it costs about 2 cents per square yard to assemble the mats. Our work was in the center of the City of Dunellen, and we were unable to assemble the mats along the road, where required, but had to take advantage of available vacant lots to do this work, and carry them from such vantage points to the job. This required four additional men, and brought our cost up to 5 cents per square yard. I believe where a highway is being constructed in the country districts, and the mats may be assembled alongside the road, the cost could be cut considerably, possibly to 2 cents per square yard, as stated by Mr. Edge.

We also found that it was desirable to tie the ends of the bars of the adjoining mats together with bar ties. This seemed to help support the mat and keep it in place when the concrete was being deposited and spread.

At the present time, I cannot think of anything else to add, except that I believe the trussed bar, which Mr. Edge has shown, may help to place the reinforcement where it belongs.

COL. WHITTEMORE: Are there any questions on this very important subject?

MR. KEASBY: I would like to inquire the approximate cost per square yard, which bar reinforcement adds to the cost of the pavement.

MR. EDGE: The approximate cost depends upon just what you will require. Ordinarily the cost would be the same or less than for mesh reinforcement, depending upon the type.

## Contract News

Prepared to August 7, 1922

Feb. 6—Route 6, Section 5, Shirley-Oldman's Creek, Reinforced Concrete Paving job, 6.812 miles, 20 feet wide with gravel shoulders, was awarded to the Benjamin Foster Company, Philadelphia, Pennsylvania, on their low bid of \$254,021.53.

Feb. 15—Route 6, Section 6—Old Man's Creek-Mullica Hill, Reinforced Concrete Paving job, 5.028 miles, 20-30 feet wide with gravel shoulders, was awarded to the firm of M. Staub, Swedesboro, New Jersey, on his low bid of \$203,660.48.

Feb. 14—Route 2, Section 3, South Broad St., Storm Drain job was awarded to A. G. Thompson, of Trenton, New Jersey, on his low bid of \$17,005.46.

March 6—Route 6, Section 10, Quinton to Marlboro, Grading and Graveling job, 5.994 miles, 20 feet wide, with earth shoulders, was awarded to the Masterson Construction Corporation, New York City, on their low bid of \$79,793.17.

March 6—Route 6, Section 11, Salem to Quinton, Reinforced Concrete paving job, 2.648 miles, 20 feet wide with gravel shoulders was awarded to Joseph E. Burke, of Plainfield, New Jersey, on his low bid of \$111,833.79.

Feb. 27—Route 10, Section 1-B, Arcadian Way to Anderson Ave. in Fort Lee, Reinforced concrete paving job, 0.48 miles, 20 and 30 feet wide with earth shoulders, was awarded to the firm of John J. McGarry, Edgewater, New Jersey, on his low bid of \$104,362.61.

Feb. 21—Route 14, Section 5, Cape May Court House to Swainton, Reinforced Concrete paving job, 2.987 miles, 20 feet wide with gravel shoulders, was awarded to the firm of Sutton and Corson, Ocean City, New Jersey, on their low bid of \$118,776.16.

March 8—Route 4, Section 9, Smithville-Mullica River, Warrenite Bitulithic job, on concrete base, 3.748 miles, thirty feet wide, with gravel shoulders was awarded to C. H. Earle of Hackensack, New Jersey, on his low bid of \$374,533.77.

March 8—Route 4, Section 6, Eatontown-West Long Branch, Sheet Asphalt job on Concrete Base, 2.69 miles, 20 feet wide with earth shoulders was awarded to the Utility Construction Company of New Brunswick, New Jersey, on their low bid of \$149,679.74.

April 14—Route 5, Section 5, Madison Ave., Madison Township and Borough of Madison, Warrenite Bitulithic on Concrete base, 2.032 miles, 20 feet wide with earth shoulders, was awarded to the Northern Construction Company, of Newark, New Jersey, on their low bid of \$117,844.37.

April 13—Route 15, Sections 2 and 3, Bridgeton-Millville, Warrenite Bitulithic on Concrete base, 8 miles, 20 feet wide with gravel shoulders was awarded to the Tri-State Construction Company of Bridgeton, New Jersey, on their low bid of \$455,500.12.

April 14—Route 4, Section 14, Laureton-Lakewood, 3.875 miles, Reinforced Concrete Paving job, 20 feet wide with gravel shoulders was awarded to C. H. Earle of Hackensack, New Jersey, on his low bid of \$144,705.68.

April 28—Route 4, Section 13, Richmond Ave., Point Pleasant Beach, Reinforced Concrete paving job, 0.848 miles, 20 feet wide with earth shoulders was awarded to C. H. Earle of Hackensack, New Jersey, on his low bid of \$35,471.76.

May 16—Route 4, Section 15, Lakewood (County section) 2.556 miles Reinforced Concrete Paving job, twenty-eight and thirty feet wide, was awarded to the Public Service Production Company of Newark, on their low bid of \$75,748.82.

May 16—Route 4, Section 15, Lakewood (Township Section) 2.556 miles, Reinforced concrete paving job, 36 and 50 feet wide was awarded to C. H. Earle of Hackensack, New Jersey, on his low bid of \$105,741.10.

May 23—Route 6, Section 12, East Commerce Street, Bridgeton, 1.314 miles long, Sheet Asphalt paving job on Concrete Base, 20 and 32 feet wide, was awarded to E. K. Mixner Co., on their low bid of \$80,422.01.

May 26—Route 9, Section 8, North Branch-Somerville, 3.837 miles, Reinforced Concrete paving job, 20 feet wide with earth shoulder was awarded to Ralph Sangiovanni, on his low bid of \$159,077.59.

May 26—Route 16, Section 3, Bedminster-Pluckamini, 2.415 miles Reinforced Concrete paving job, 20 feet wide with earth shoulders was awarded to Ralph Sangiovanni, on his low bid of \$135,648.39.

May 26—Route 4, Section 16, Maine St., Toms River, 1.096 miles long, Reinforced Concrete paving job, 20, 30, 36, 38 and 56 feet wide with gravel shoulders was awarded to the Public Service Production Company of Newark, on their low bid of \$62,864.59.

June 2—Route 5, Section 9, Barkers Corner-Hacketts-town, 2.99 miles Reinforced Concrete paving job, 20 and 48 feet wide with earth shoulders was awarded to Frank J. Groman, of Bethlehem, Pennsylvania, on his low bid of \$230,274.37.

June 6—Route 2, Section 3-A, Whitehorse-Crosswicks Creek, 0.389 miles, Reinforced Concrete paving job, 30 and 40 feet wide was awarded to Daniel Klockner, of Trenton, New Jersey, on his low bid of \$37,472.82.

Jan. 10—Route 6, Section 8, Pearl St., Bridgeton, Reinforced Concrete paving job, 0.455 miles, 20 and 30 feet wide with gravel shoulders was awarded to the Tri-State Construction Company, Bridgeton, New Jersey, on their low bid of \$76,302.36.

April 5—Route 4, Section 10, Shadow Lawn-Roseld Avenue, Sheet Asphalt Paving job on Concrete Base, 2.41 miles, 20 and 36 feet wide with earth shoulders, was awarded to Newark Paving Company, of Newark, New Jersey, on their low bid of \$104,969.51.

April 4—Route 2, Section 3, South Broad Street, Sheet Asphalt job, on Concrete Base, 0.648 miles, 48.5 feet wide, was awarded to J. J. Barrett, Trenton, New Jersey, on his low bid of \$69,433.77.

March 1—Route 11, Section 1, Main Street, Passaic, Sheet Asphalt job, on Concrete Base, 0.257 miles, 22 feet, 2 inches wide, was awarded to Union Building Construction Company, Passaic, New Jersey, on their low bid of \$15,160.15.

April 5—Route 4, Section 12, Sea Girt Avenue, Reinforced Concrete Paving job, 0.162 miles, 20 feet wide with earth shoulders was awarded to T. H. Riddle, New Brunswick, New Jersey, on his low bid of \$8,569.23.

April 4—Route 9, Section 6, Somerville-Bound Brook, Reinforced Concrete Paving job, 2.491 miles, 20 feet wide, earth shoulders was awarded to Salmon Brothers, Netcong, New Jersey, on their low bid of \$131,710.10.

March 31—Route 4, Section 5-A, Storm Drain in Red Bank, was awarded to Chas. J. Romano, Montclair, New Jersey, on his low bid of \$15,314.85.

April 10—Route 6, Section 9, Salem-Collier's Run, Reinforced Concrete Paving job, 4.752 miles, 20 feet wide with gravel shoulders was awarded to Sampson & Reuter, Elizabeth, New Jersey, on their low bid of \$196,975.08.

April 18—Route 9, Section 5, Union Avenue, Bound Brook, Sheet Asphalt on Concrete Base, 1.501 miles, 20 feet wide with earth shoulders was awarded to the Utility Construction Company of New Brunswick, New Jersey, on their low bid of \$93,090.31.

April 10—Route 3, Section 8, Camden-Clements Bridge Road, Reinforced Concrete Paving job, 3.82 miles, 36 and 40 feet with earth shoulders was awarded to W. Penn Corson, Camden, N. J., on his low bid of \$269,644.85.

April 10, Route 3, Section 9, Clements Bridge Road-Kirkwood, Reinforced Concrete Paving job, 3.756 miles, 29 feet wide with earth shoulders was awarded to John M. Kelley Construction Co., Camden, N. J., on their low bid of \$200,592.95.

April 10—Route 3, Section 10, Kirkwood-Berlin, Reinforced Concrete Paving job, 5.576 miles, 29 feet wide with earth shoulders was awarded to John M. Kelley Construction Co., Camden, N. J., on their low bid of \$297,993.89.

May 20—Route 9, Section B, West Front Street, Plain-



# The Highwayman

field, Sheet Asphalt paving job on Concrete Base, 1.929 miles, 40 and 41 feet wide, was awarded to the Union Paving Company, of Newark, New Jersey, on their low bid of \$219,316.20.

June 20—Route 1, Section 6, Trenton City Line-Nottingham Way, reinforced concrete paving job, 0.928 miles, 39 feet, six inches wide, was awarded to Rees and Taylor, of Trenton, New Jersey, on their low bid of \$95,347.47.

June 21—Route 4, Section 5-A, Maple Avenue, Red Bank, Sheet Asphalt paving job on Concrete Base, 1.308 miles, 40, 33 and 22 feet wide with earth shoulder was awarded to J. J. Barrett, of Trenton, New Jersey, on his low bid of \$93,429.13.

June 21—Route 4, Section 11, Main Street, Avon, New Jersey, Warrenite Bitulithic surface on Concrete Base, 0.663 miles, 43 feet wide with earth shoulders was awarded to the East Jersey Bridge Company, of Perth Amboy, New Jersey, on their low bid of \$54,814.34.

June 21—Route 5, Section 6, Speedwell Avenue, Morristown, Warrenite Bitulithic surface on Concrete Base, 1.426 miles, 23 feet, 3 1/2 inches wide was awarded to J. S. Geiger Sons of Newark, New Jersey, on their low bid of \$144,892.74.

June 21—Route 9, Section 9, Phillipsburg-Still Valley, Reinforced Concrete paving job, 1.68 miles, 20 and 36 feet wide with earth shoulders was awarded to Crilly and Cannon of Phillipsburg, New Jersey, on their low bid of \$110,345.40.

July 7—Route 4, Section 17, Barnegat, Reinforced Concrete job, 1.0 miles, 20 feet wide with gravel shoulders, was

awarded to the Public Service Production Company of Newark, New Jersey, on their low bid of \$43,931.94.

July 7—Route 4, Section 18, Tuckerton, Reinforced Concrete job, 1.5 miles, 20 feet wide with gravel shoulders, was awarded to the Public Service Production Company of Newark, New Jersey, on their low bid of \$59,913.83.

July 13—Route 9, Section 7, Main Street, Somerville, Reinforced Concrete job, 0.497 miles, was awarded to J. L. Bachman of Linden, N. J., on his low bid of \$74,180.25.

July 14—Route 16, Section 2, Mine Mount Road-Bedminster Corner, Reinforced Concrete job, 2.515 miles, was awarded to the Engineering Construction Corporation, Philadelphia, Pennsylvania, on their low bid of \$166,802.65.

July 14—Route 1, Section 13, Highland Park-Stelton Road, Warrenite Bitulithic on Concrete Base, was awarded to S. S. Thompson & Company, Incorporated, Red Bank, New Jersey, on their low bid of \$305,394.61.

July 14—Route 1, Section 14, Stelton Road-Metuchen, Warrenite Bitulithic on a Concrete Base, was awarded to S. S. Thompson & Company, Incorporated, Red Bank, New Jersey, on their low bid of \$344,784.65.

July 14—Route 9, Section 9A, Still Valley-Bloomsbury, Reinforced Concrete job, 2.92 miles, was awarded to Bernard E. Tighe Construction Company of Easton, Pennsylvania, on their low bid of \$127,785.84.

July 21—Route 5, Section 8, Great Meadows-Barker's Corner, Reinforced Concrete, was awarded to Salmon Bros., Netcong, New Jersey, on their low bid of \$186,688.69.



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1922

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"Center Joint" type of construction, showing re-inforcing fabric in place (in foreground); and placing concrete over fabric. (Budd Lake, Route 5)

## Note

The papers presented at the recent Convention of the New Jersey Highway Association, and the discussions following them, are such a valuable contribution to the progress of road-building that it has been decided to publish them in full with as many as possible of the charts and illustrations used. (It has not been possible to include all of these, however, so there are occasional references in the text, to photographs and charts which have not been reproduced).

Our aim is to publish one or two of the Convention papers, with the discussion thereon, each month. We suggest that these be carefully filed, so that the reader may keep the complete set, which will make a very valuable addition to his road-building library.

This month we are printing "Merits of Bar Reinforcement for Concrete Pavements", by W. S. Edge, Concrete Steel Company, and the discussion thereon at the convention; also "The Proper Weight and Methods to Use to Secure the Desired Results with Sheet Fabric Reinforcement for Concrete Pavements", by W. C. Kuhn, American Steel and Wire Co., and the discussion thereon at the convention, and "Contract News" prepared to August 7, 1922.

Next month there will be published "The Proper Treatment of Posts for Guard Rails", by Edward T. Paddock, Carbolineum Wood Preserving Company, and the discussion thereon at the convention; also "The Advantages and Objections of a Sheet Asphalt Pavement With and Without a Binder Course", by Abram Swan, City Engineer, Trenton, New Jersey, and the discussion thereon at the convention.

By Mr. W. C. Kuhn, American Steel and Wire Co.

The manufacturer of steel has no objections, from a

It is not practicable to design and construct our concrete highways as a clear span from edge to edge of the slab. This would make the cost of construction so expensive that it would be prohibitive. It is, therefore, necessary to properly prepare the subgrade by draining and rolling, so that there is reasonable assurance of the slab being supported at all points. We, therefore, get back to





# The Highwayman of New Jersey



Placing the Freshly Mixed Concrete on the Reinforcing

## Discussion of Mr. Kuhn's Paper

By Harry D. Beaton—National Steel Fabric Co.

In discussing Mr. Kuhn's paper let me amplify briefly the history he has given of the use of reinforcement.

By 1914 the concrete pavement was generally recognized as one of the durable pavements that would withstand heavy traffic. Its use was rapidly increasing. Even before then, however, far-sighted engineers had become aware that no known pavement that could be economically constructed over long periods of time could possibly endure the geometric increase in traffic, both in volume and weight, that was occurring. Something had to be done. Engineering Principles offered the suggestion: Why not steel reinforcement? The idea was scientifically sound, as Mr. Kuhn has proven, but its general adoption was impeded by the from Missouri mental attitude, by the penny-wise financial policy, by the clamor of conflicting claims of material interests, and by the natural reluctance of road builders to be bothered by new devices. Stronger than all these was the impelling need created by the traffic situation. State after State viewed with alarm the deterioration of its pavements—the loss in invested capital was unpleasantly obvious to the tax-payer. The use of reinforcement spread in growing ratio to the results noted, until now Pennsylvania requires its altogether, New York almost entirely, North Carolina very largely in a comprehensive road building program, and New Jersey and other progressive States to a considerable extent. It has stood the test—roads built with reinforcement endure, with less maintenance than roads without it. It reduces the ultimate, or real cost of the road.

One other fact about reinforcement has been proved by use; it pays to use heavier material than was at first anticipated. Pennsylvania has even gone up to sixty-five (65) pounds. A comparison of pavements reinforced with weight from thirty-five to sixty pounds built and used under similar conditions shows a better present condition and lower total maintenance cost as the weight of reinforcement has increased. The Engineering News Record of January 12, telling what 1921 developed in Paved Road Design, says: "An increase of the weight of the steel was observable in all states where reinforcing is general."

The ideal condition to be met, that is, on stable soil,

would be to have sufficient reinforcement to offset temperature stresses, for longer slabs, but that is now economically impracticable. We approach it as a constant under variable conditions of soil, climate, traffic and finance. What the engineers want to know is exactly what a given amount of reinforcement will do for a certain thickness of slab under certain conditions.

In the number of reasons that Mr. Kuhn gives for the use of reinforcement, I would add that the use of it prevents blow-ups; and prevents one part of the slab riding above the other at cracks, causing surface unevenness. Surface unevenness gives a jolting ride, and causes damage by impact. I agree from the higher tensile strength of wires and greater superficial area for bond strength, that wires should be allowed a preferential, based on their increased tensile and bond strength.

I agree with the 56 pound weight per 100 square feet and where economic conditions justify I might even suggest a slightly heavier material. I believe, too, that all concrete bases should be reinforced. I have noted asphaltic pavements whose surface was spoiled by cracking at the base, at regular intervals through contraction and these could have been prevented by reinforcement, which would have obviated the larger cracks.

In specifications I agree with Mr. Kuhn's ratio of about five or six transversely to one longitudinally of the pavement, if the slab is full width. But where the slabs are from nine to twelve feet in width, experience has shown that the lightly reinforced slabs do not crack longitudinally; under these conditions it is our transverse cracks that are troublesome.

I would, therefore, advocate two layers of reinforcement, with the bulk of metal placed longitudinally in order that the length of slab might be increased and to take care of the contraction cracks.

In conclusion, let me emphasize the thought, that experience has fully demonstrated that the weight of steel fabric now being most popularly used—that is approximately 56 pounds per 100 square feet—is the most economical from the standpoint of the original cost of the pavement, as well as the ultimate cost; that is, this amount will give the greatest return for the money expended and this is the ultimate to which we all aim.



Showing method of laying concrete road in two sections, with header curb adjacent to trolley tracks.

## General Discussion of Mr. Kuhn's Paper

COL. WHITEMORE: You all doubtless know of the widespread use of wire as reinforcing in glass in large window areas. Some of the large steamship terminals on the Hudson River at Hoboken opposite New York have a great many thousand feet of reinforced glass in windows 12 feet square, and to my knowledge none of those panes of glass have been taken out and replaced since I put them in, in the early part of 1900, and in some cases the glass has cracked into thousands of pieces but the wire still holds them to exclude wind and water. As Mr. Kuhn says, concrete, I take from the speakers' papers, has very largely the tradition of holding the concrete together due to its tendency to spread by any changes in temperature and so this is an exceedingly important subject, we would be very glad to hear questions on these papers at this time.

MR. SPARKS: I understood Mr. Beaton to say in one case where cracks occurred under a concrete slab, that if the base had been reinforced, this would have caused the cracking or the cracking would not have occurred at all.

COL. WHITEMORE: The crack might have occurred, but it would not have materially spread. It would have been held together by the wire.

MR. BEATON: Right.

MR. SPARKS: Do you know positively that the crack would not have occurred if the wire had been in it?

MR. BEATON: We have found by experience that if there is wire in it the cracks have not occurred. In asphaltic concrete pavements, there are numerous cases where if reinforcement had been used in the base of the pavement in question, it would have prevented certain cracks appearing on the surface. If reinforcement is good for a concrete wearing surface, it certainly can be advantageously used in a base under an asphaltic pavement.

MR. SPARKS: Does it apply especially to wearing surfaces? I believe they have changed the transverse joints from 80 to 40 feet because it was found that the old idea of placing transverse joints still applied.

MR. BEATON: Pennsylvania, in 1921, I think, placed their transverse joints about 100 feet apart up to 200 feet. They were less in some places where the mixer stopped. I do not think they had any more serious cracks in 1921 than when they put the joints 64 feet apart.

MR. BURN: I would like to ask Mr. Kuhn which he considers better, the practice of placing wire fabric on the bottom and pulling it up through the concrete or placing a layer of concrete about 2 inches deep and then laying the fabric on it?

MR. KUHN: By all means strike off the concrete before you finish the leveling and place the reinforcing material. You never know, when pulling up through the concrete, exactly where it is. You do know exactly where it is the other way.

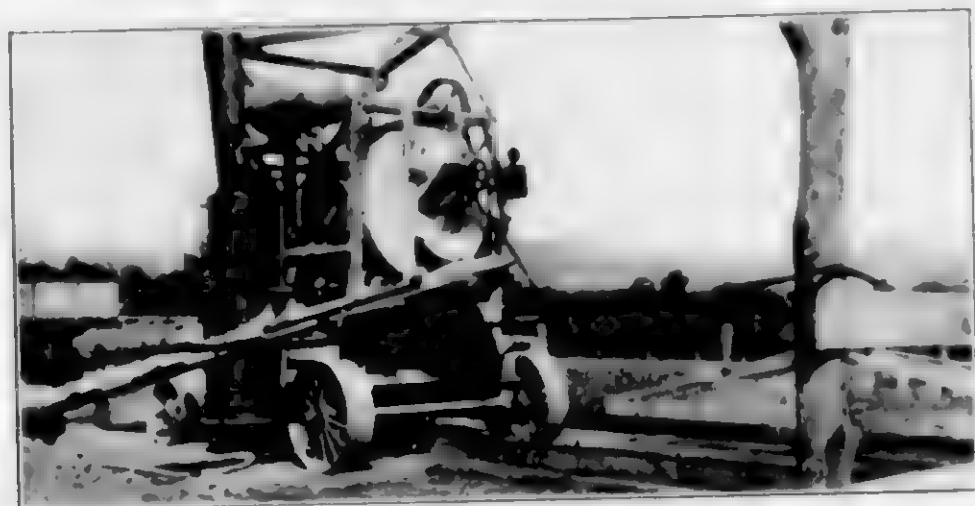
MR. BURN: That was the method used on our Budd Lake job—striking off the concrete.

MR. KUHN: I know of one case where instead of pulling it up through the concrete, the men got tired and laid it on the subgrade and forgot it. In that case it was a pure waste of wire as it did not do any good. First strike off the concrete and then lay the reinforcing material.

MR. BURN: From observation I believe that is the common practice and not laying the wire on the bottom and attempting to pull it through.

MR. ALDRICH: Do you know of any experimental results as to placing reinforcement near the top or near the bottom?

MR. KUHN: Personally I do not know of any such tests made. There are many theories about what happens to concrete slabs when they heave, but as the ground beneath your slab is usually of a cool nature, it is natural to assume that the heaving action occurs to your slab more when it freezes and is more or less uniform. That is borne out by trolley rails on ties above the surface of the ground where they leave a space of a quarter of an inch for contraction and expansion and fasten with bolts. If we put the rails beneath a brick or Belgian block pavement we can weld the joints together, which would be an absolutely rigid connection. The rails on State Street of this city are laid in that manner showing that the heat does not penetrate below the slab. After the slab has heaved due to freezing there comes a thaw and the edges of the pavement are apt to sink before the middle. In that case the middle is supported and as the two sides expand the slab cracks. The compressive strength of concrete is high but the tensile strength is low.



Beginning to Laying of Concrete on the Brick Lagoon Parkway Job, Route 9, N. J.

Mr. ANDRICH: The effect of the frost is realized. The ground thaws down for a few inches and becomes soft. Then you may get a cold night or two or three cold days and the ground which has thawed and become full of water will freeze and expand. In that case you would have your expansion near the edge of the pavement and you would need your steel near the bottom.

Mr. KUHN: I differ with you. Two-thirds of this thawed surface becomes soft and sinks half an inch and when this freezes it is not going to affect the edge of the slab.

Mr. ANDRICH: I meant to show the different theories. There should be some experimental sections laid with the reinforcing in the top and also in the bottom so as to get practical results.

Col. HOWARD: This question has been gone into for 20 years, as to where the reinforcing is needed, whether it should be 2 in. from the top or 2 in. from the bottom. Engineering practice and better judgment decree that it shall be 2 in. from the top. The old Clinton Wire Cloth Company, originators of wire cloth fabric, found that out in southern California. The Southern Pacific Railroad Company have a number of oil wells. At certain times of the year they would have an excess quantity of oil and had to store that oil somehow. They scraped holes in the ground but lost a considerable amount of oil by seepage with that method. They tried ordinary concrete but that cracked all to pieces and the result was a failure. They tried using mesh both from the top and bottom and found when they used 1½ in. mesh with a 4 in. slab of concrete just below the top of the surface of the concrete these cracks were not found. There were some hair-line cracks on top of the concrete but nothing serious. They only used 20-22 pound mesh. This showed that the better place to put your mesh was on the top below the surface. It also showed the advantage of mesh over bar.

Mr. BURN: We had a piece of road constructed near Glen Gardner. We used reinforcement 25 lbs. per 100 square feet 2 in. from the top. Only one crack appeared a short time ago. The mix was 1-2-3 and 6 in. concrete.

Mr. BRAGG: In line with the question relative to preventing cracks in the base by Mr. Sparks and the proper weight to use, I will say that at the last convention of the American Association of State Highway Officials, the office of the Bureau of Public Roads presented figures to show that in order to absolutely prevent cracking of the concrete in pavements it would be necessary to use 1,230 lbs. per 100 square feet instead of 56. I believe the theory and accepted idea is that this reinforcement can prevent cracks from opening up rather than to prevent these cracks entirely. I would like to ask Mr. Kuhn if he does not feel that in a good many cases, by this method of laying fabric by placing it upon a 2 in. layer of concrete that the bond is destroyed at the line of reinforcement due to the fact that the concrete may lie there until it is pretty thoroughly dried out and more or less disintegrated before the fabric is placed.

Mr. KUHN: In my opinion that can only happen possibly through drying out after being spread to grade of the surface area of the first layer of concrete before putting on the reinforcement. If it is put down in sheets, the

time of the interval between striking off the concrete and laying the reinforcement is only a couple of minutes and there is no chance for drying out. You waste that much time in shutting the boom or chute on the mixer. If you spread an area of 15 or 20 feet square and then go back and place reinforcement over that area of either fabric or bars, the first portion is going to be somewhat dried up.

Mr. BRAGG: I had in mind the delay in getting the material to the mixer. It is necessary to shut down the mixer and sometimes you have a portion of your fabric covered and the other half uncovered. It is good practice to throw that material off the subgrade but I do not think it is done. What do your specifications call for when you come to the end of a slab?

Mr. KUHN: The specifications call for finishing that slab. You call for finishing and putting in an expansion joint rather than taking a chance on getting a proper bond between the concrete going against your slab that was standing for some time. The same thing holds true with a layer of concrete on the ground.

Mr. BRAGG: I do not feel that in a good many cases the wearing strength and value of the concrete under a layer of fabric is destroyed.

Under certain atmospheric and ordinary workday conditions, we get a layer too thin to guarantee any sort of satisfactory concrete.

Mr. KUHN: You have in mind two layers of reinforcing, one layer 4 in. or 6 in. from the bottom. Then with two layers of reinforcement, it does not take long to spread the concrete and put the fabric on it.

Mr. SPEER: I would like to ask if you have had any experience in having the wire leave a void after the finishing machine has gone over the top layer. Whether the finishing machine when going over and tamping, does not have a tendency to drive the wire down which springs back and leaves a void.

Mr. KUHN: I could not say. I have had no practical experience in that connection. From my observation I would not imagine that you would get voids. There is a certain amount of spring in your reinforcement, too, which would take care of this. The tamping of the finishing machine would force down the fine as well as the coarse aggregate if a void should happen to occur.

Mr. COLLINS: Mr. Chairman, I would like to ask a question. I think the matter of monolithic construction in concrete road paving is a very important one. I have just built a section of road in Cranford which is taken care of by reinforcing. These slabs averaged 43 feet in length and 15 feet in width. Around the edge there is one 5/8 in. bar. Longitudinal bars run right through the joints. The principles of construction are the simplest imaginable. There is no question about monolithic construction being a very good one. The simplicity of the thing commends itself, as there is only one operation. I think the transverse joints are handled the same way. They are belted and the slab rolled and finished with one operation. After finishing there is a certain amount of finishing with a trowel. The best way to bind each slab around with heavy reinforcement. It has been very successful so far. Steel is 5/8 in. square.



Shooting method of dumping the concrete from truck on

the fabricated bar reinforcing Dunellen, Route 9, N. J.

Col. WHITTEMORE: That reinforcement was bars of iron.

Mr. SHERRAUM: I believe there is a corrosive effect on steel after it is placed in the concrete. I would like to inquire whether the wire should be galvanized, and if not whether there is any particular advantage in galvanized wire outside of the fact that it prevents corrosion before it is put in the pavement.

Mr. KUHN: We recommend ungalvanized wire. With

the galvanized wire the only real advantage is that a contractor might get a carload of material and let it lay around for six months and in the meantime it becomes badly corroded. A solid coat of rust on the wire does not affect the strength of the wire and materially increases the bond between the concrete and the steel. If it is a coarse scale, then the only bond is with the scale and not with the steel, and then the steel is not functioning. That is the only disadvantage of galvanizing.

## Merits of Bar Reinforcement for Concrete Pavements

By W. S. Edge, Concrete Steel Co.

The subject of bar reinforcement for concrete pavements is one that has occupied a good deal of my time for the past three years. My company has been interested in the matter to the extent that they desired to find out whether concrete pavements needed reinforcement and if so what was the best type and the proper amount of steel to use for this purpose. In other words that was my job. Please do not think that I pose as an expert who will tell you the correct solution of this whole matter, but rather as one who is studying the great problem with a view of determining the best way of doing the job in the most economical manner possible.

My interests have been mainly directed heretofore along the lines of reinforced concrete building construction and similar heavy structures of reinforced concrete. In the early days of this industry there was a great deal of both woven and welded mesh used for reinforcement particularly for floor slabs where large areas were employed. We soon found, however, that a deformed bar reinforcement could be substituted with marked economy, particularly where heavy reinforcement was required. It has become almost the universal practice in the building world, therefore, to use deformed bars, and with the advent of more rigid specifications, various types of supporting and tying devices to space and support the steel have come into use. We still

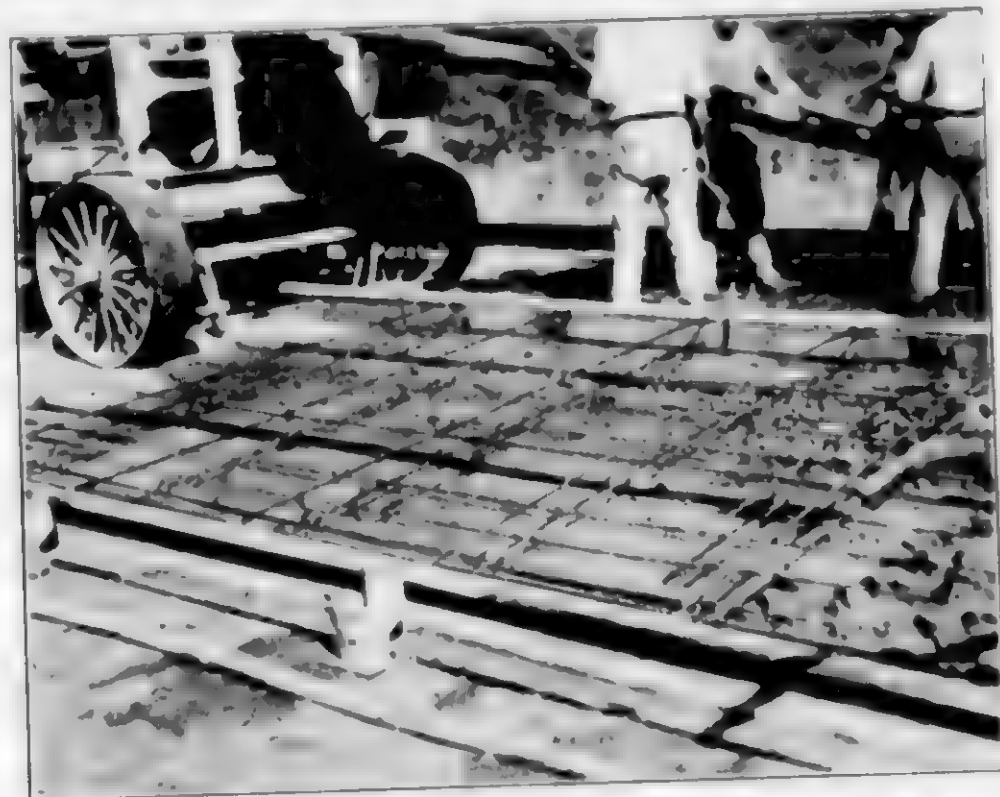
use mesh in certain kinds of pipe and sewer work where it has advantages and also for light shrinkage reinforcement in buildings over so-called joist construction. It is also used in New York City in combination with skeleton steel construction and cinder concrete arches where an archaic building code allows this type of reinforcement certain advantages. With our past experience it was perfectly natural that we should expect to find an economy in the use of deformed bars in concrete road construction and such we have found to be usually the case where a reinforcement of 40 lbs. weight per 100 sq. ft. or greater is required. A deformed or plain steel bar is one of the very cheapest forms into which the metal can be rolled and that in a measure, explains its now well nigh universal use in reinforced concrete construction.

In the course of our experience with reinforced concrete buildings and other reinforced concrete structures we have developed numerous special devices which, in certain classes of work have effected marked economies in assembling steel reinforcement. In every case their use has produced a better and more workmanlike job and where there was much repetition of similar arrangement of reinforcing elements remarkable economies have been secured.

This is true of such structures as docks, piers and warehouses and also of pre-cast concrete piles.

We experimented with various methods of introducing





*"Cross of Shewing Terms for Sale of Pavement and Center Joint also for Rebuilding  
in Part West Chester Route No. 8."*

steel bars into a road and soon reached the conclusion that no method of placing concrete could be so simple, efficient, inexpensive and as devoid to the construction. The road contractors with particular interest in the method of placing loose bit reinforcement, found the time when this bit was sufficient to start something. As the time have standardized on the use of loose bit reinforcement, the units or mats, the size of which depends on the character in which the concrete is to be used. If the concrete they are made either the full or half width of the road and from 8 to 14 ft. long. The contractor is interested by the type of equipment employed by the contractor, for example, if he is using a machine and the length of the great as 14 ft. may be adopted and the length of the bit may not wish to pour more than one foot of concrete.

The first road work with which we had to do was where bar reinforcement was employed as at East in the field, Mass., on a State Road job. John B. Smith and I were contractors. Many of the details of the work were worked out by the State Engineers of the Massachusetts State Highway Department and the engineer of the contractors. We sold the steel, but others were more observers than directors of this operation.

The reinforcement consisted of square bars, 1/2 inch square, spaced about 2 feet apart transversely and concentrated longitudinally near the edge and centre of the road. These mats were 9 ft. 8 in. x 14 ft. 0 in., one half of the 20 ft. road being built at a time. For a mat of this type it is possible to build the assembly frame waist high since all the ties can be made from the outside. The fabrication was a comparatively simple operation. The bars in bundles were distributed along the right of way so that a pre-determined number of mats could be made up at any given point. The assembly frame was very light and was easily carried by two men from one point to the next. The bundles of bars were cut open and the bars placed in the frame, only three lengths of bars being used on this work. Then they were tied at all intersections and the assembled units were piled along side the road. Two men easily kept ahead of the work and did not have to work steadily either and the contractor averaged about 410 lineal ft. of 10 ft. width of road a day.

The specifications called for bottom reinforcement and the mat of bars was placed directly upon three pipe supports which were pulled out as the concrete came in.

The contractor was well pleased with the progress made on this work and informed me that the use of the reinforcing steel did not retard his progress noticeably. Dowels were used on this work across the longitudinal centre joint. The road being constructed half at a time, these

deciduous were cut at the same place, placed in the first section and cut at the same point but at the exact point of death. Then the wood to provide a certain amount of wood at the point.

Many other countries have been visited, and the following were carried out in Mexico, Central America, the West Indies, New York, and New Jersey:

York, and New Jersey.

In New Jersey through the courtesy of the Highway Department, two roads were built in which a top and bottom reinforcement combined and a decreased bars was substituted for two layers of each which was originally specified. It was found that bars were a waste where a single layer was substituted for two if it is the contractor in the field who is to do the work. With the use of tidine he was able to place at least two inches of concrete and then use the top reinforcement mat, then run more concrete to cover it, varying to a half of the top, then place his second reinforcement mat and finish the section. With bar matting the bar cutting operations are reduced to placing the mat sections of steel and concreting his entire section at one time. The cost of this reinforcement was about the same as the cost of the reinforcement and is far from what you think it is. He is able to improve on it at several points, but it served his purpose and so far the cost was not too far from the cost of the mats. The cost of making the mats in the field and moving them, altogether with the cost of the reinforcement, is about the same as the cost of the reinforcement.

The methods used in Route 2, Section 2, known as the West Portland job, are similar to those used on earlier jobs with the exception that the necessity of tying the concrete in the joints made it time consuming from the ground because of the addition of structural angles on the top of the forms. It is sound, is easily carried and more rapid. Two men fabricating easily kept ahead of the work and I paid a fixed rate of a sub-contract at one cent per sq. yd. of reinforcement. I have heard many favorable comments on this work, but I have also heard some criticism of minor details. Personally I do not like the method of supporting from the slab, do not do it I consider the reinforcement sufficiently rigid in itself so that our efforts have been directed toward making improvements in the method without increasing the cost.

We have always taken the attitude that it was not our function to design the road reinforcement, but that when the highway engineer told us what he wanted then we would be glad to make suggestions as to the best method of carrying out his wishes in a practical way, always with a view to providing an economical construction.

During the past year I have spent a great deal of time



Putting the Concrete in Place, note the even spacing of the Reinforcing Bars  
(West Portal Job, Route 9)

with Highway Engineers from North Carolina to Maine and as far west as Kansas, and as a result of the very pleasant friendship and discussions it seems to me that the researches of Mr. A. I. Condit, at Washington, D. C., and of Mr. Clifford Oeder at Springfield, Ill., stand out above the other investigations, so work that has been done and form really a large advance toward the solution of this question.

Without going into great detail with regard to these experiments which would form sufficient material for a volume, perhaps the following points are worth attention:

A concrete slab piers or reinforced works due to temperature changes, lifting in the centre in the middle of a winter day and settling at the edges at night. This phenomenon is especially marked with an 18-in. or 20-in. slab and steel cause its failure by a longitudinal crack from the centre, our friends from Pennsylvania to the contrary notwithstanding.

The weakest portion of the slab seems to be the corners at transverse joints and at the centre. Unless the subgrade is bad, the stresses in the under side of the slab do not seem to be serious in a 20 ft. road where a centre longitudinal joint is used.

The dovetailing of the slabs together longitudinally and stiffening the edges of the slabs is highly important and transverse reinforcement in the top of the slab is absolutely necessary.

To meet these conditions as we believe them to exist we have developed a design which was shown for the first time at the Chicago Good Roads Show. This caused so much interest that we are encouraged to recommend it for all concrete roads where conditions justify its use.

This unit is designed to rest directly on the sub-grade being supported along the edges on the ends of the hooked transverse rods and at the 1-3 points by the truss support bars. It can be collapsed flat for piling and transporting if desired.

The cost of fabrication is only slightly greater than that of a plain mat of the same size and the same number of ties. It can be made either upside down or right side up

in the assembling frame. One would naturally think that there would be a tendency for this unit to collapse in use, but such has not proved to be the case; as a matter of fact the first unit of this type that we built successfully resisted the efforts of 4 men to collapse it. Certain changes in the thing were necessary to produce the desired result. The combination of deformed bars and spring wire bar ties gives exactly the action we desire, i. e. a yielding yet powerful spring grip which will allow the bar to be rotated but will not allow either bar to slip under normal usage.

Considering the details of design, our main reinforcement is transverse near the top of the slab with a concentration of longitudinal steel near the edges and centre of the road where it is most needed.

The truss bars are not counted as full reinforcement because parts of them which touch the ground will undoubtedly rust out in the course of time. So far we have found no other method of support which is equally satisfactory that does not cost more than this and besides, anything in the nature of chairs or auxiliary supports would be a nuisance and just one thing more the contractor would have to bother with.

The cost of this type to the contractor will be about the same or less than mesh or fabric at present prices from \$6 lb. per 100 sq. ft. and up. There are certain factors that must be borne in mind, however. We use preferably  $\frac{1}{2}$  in. round bars, although in the heavier weights  $\frac{3}{4}$  in. round or square bars may be employed.

The spacing of the bars should be wide enough so that a man can step freely through it.

I believe that this self-supporting feature should commend itself to engineers and contractors alike, especially when you consider that it can be secured at only a slight increase in cost over plain bar reinforcement and at no increase at all over fabric as now employed.

We have also developed several types of double reinforcement which are an improvement over that used last summer, in our opinion.

## Discussion of Mr. Edge's Paper

By Mr. C. A. Burn, Northern Division Engineer

MR. BURN: I have listened with considerable interest to Mr. Edge's paper, especially the part concerning bar reinforcement.

The State Labor Division used bar reinforcement in some work at Dunellen, N. J., on our Route No. 9. This work consisted of constructing approximately one mile of one course reinforced concrete pavement, 1-2-4 mix, eight (8 in.) thick, and was laid in two sections, one on either side of the trolley tracks. Each section was 12 feet wide, with an 8 inch header curb on the side adjoining the trolley tracks, cast integral with the pavement.

The reinforcement was of the double line type, made up of two mats of  $\frac{3}{8}$  in. deformed bar, 11 ft. x 12 ft. The main members in each mat ran longitudinal with the pavement, and were spaced 9 in. center to center on the bottom mat, and 18 in. center to center on the top mat. Transverse members in each mat were spaced 28 in. center to center. The mats were separated by six spacers which were made up of  $\frac{3}{4}$  in. bars bent in a rectangular shape, about 3 ft. 6 in. long and  $3\frac{1}{4}$  in. wide. Intersections were tied with No. 2 Havemeyer Bar Ties.

The main difficulty we encountered in handling this reinforcement was in getting it placed in the proper position in the pavement. First, we tried using about 12 common bricks, broken in half, and placed on the sub-grade, in order to keep the mats the required 2 in. from the bottom of the sub-grade, but this did not prove entirely satisfactory. Later, we used four 2 in. pipe.

The difficulty we found in using pipe was when we attempted to pull it from under the wet concrete, since we had to handle it by man power, as the concrete was mixed at a central plant and hauled directly to the work in one ton Ford trucks, equipped with Lee Dump Bodies.

We improvised a temporary platform, one end of which was rested on the trolley rail, and the other end on legs set in the sub-grade, and the trucks were backed on to this small platform and the concrete dumped directly upon the mats. The dumping of this heavy mass of concrete caused the mats to settle in the center, and spring up on the sides. In order to overcome this, great care was taken in dump-

ing the first load, and spreading same properly, working the concrete under the mat all the while. After spreading the first load carefully, it was an easy matter to spread the remaining three loads, the amount required to complete the section.

If some method can be devised to place the mats properly on the subgrade, and then retain them in position while the concrete is being deposited, I believe that bar reinforcement will work out much better than fabric reinforcement.

Mr. Edge, in his paper, mentions that it costs about 4 cents per square yard to assemble the mats. Our work was in the center of the City of Dunellen, and we were unable to assemble the mats along the road, where required, but had to take advantage of available vacant lots to do this work, and carry them from such vantage points to the job. This required four additional men, and brought our cost up to 5 cents per square yard. I believe where a highway is being constructed in the country districts, and the mats may be assembled alongside the road, the cost could be cut considerably, possibly to 2 cents per square yard, as stated by Mr. Edge.

We also found that it was desirable to tie the ends of the bars of the adjoining mats together with bar ties. This seemed to help support the mat and keep it in place when the concrete was being deposited and spread.

At the present time, I cannot think of anything else to add, except that I believe the trussed bar, which Mr. Edge has shown, may help to place the reinforcement where it belongs.

COL. WHITTEMORE: Are there any questions on this very important subject?

MR. KEASBY: I would like to inquire the approximate cost per square yard, which bar reinforcement adds to the cost of the pavement.

MR. EDGE: The approximate cost depends upon just what you will require. Ordinarily the cost would be the same or less than for mesh reinforcement, depending upon the type.

## Contract News

Prepared by August 1, 1927

Feb. 6—Route 6, Section 5, Shirley-Oldman's Creek, Reinforced Concrete Paving job, 6.812 miles, 20 feet wide with gravel shoulders, was awarded to the Benjamin Foster Company, Philadelphia, Pennsylvania, on their low bid of \$254,021.53.

Feb. 15—Route 6, Section 6—Old Man's Creek-Mullica Hill, Reinforced Concrete Paving job, 5.028 miles, 20-30 feet wide with gravel shoulders, was awarded to the firm of M. Staub, Swedesboro, New Jersey, on his low bid of \$203,660.48.

Feb. 14—Route 2, Section 3, South Broad St., Storm Drain job was awarded to A. G. Thompson, of Trenton, New Jersey, on his low bid of \$17,665.06.

March 6—Route 6, Section 10, Quinton to Marlboro, Grading and Graveling job, 5.994 miles, 20 feet wide, with earth shoulders, was awarded to the Masterson Construction Corporation, New York City, on their low bid of \$79,793.17.

March 6—Route 6, Section 11, Salem to Quinton, Reinforced Concrete paving job, 2.648 miles, 20 feet wide with gravel shoulders was awarded to Joseph F. Burke, of Plainfield, New Jersey, on his low bid of \$111,533.79.

Feb. 17—Route 10, Section 1 B, Arcadian Way to Anderson Ave. in Port Lee, Reinforced concrete paving job, 0.48 miles, 20 and 30 feet wide with earth shoulders, was awarded to the firm of John J. McGarry, Edgewater, New Jersey, on his low bid of \$104,362.61.

Feb. 21—Route 14, Section 5, Cape May Court House to Swainton, Reinforced Concrete paving job, 2.987 miles, 20 feet wide with gravel shoulders, was awarded to the firm of Sutton and Corson, Ocean City, New Jersey, on their low bid of \$118,776.16.

March 8—Route 4, Section 9, Smithville-Mullica River, Warrenite Bitulithic job, on concrete base, 3.748 miles, thirty feet wide, with gravel shoulders was awarded to C. H. Earle of Hackensack, New Jersey, on his low bid of \$374,533.77.

March 8—Route 4, Section 6, Eatontown-West Long Branch, Sheet Asphalt job on Concrete Base, 2.69 miles, 20 feet wide with earth shoulders was awarded to the Utility Construction Company of New Brunswick, New Jersey, on their low bid of \$149,679.74.

April 14—Route 5, Section 5, Madison Ave., Madison Township and Borough of Madison, Warrenite Bitulithic on Concrete base, 2.032 miles, 20 feet wide with earth shoulders, was awarded to the Northern Construction Company, of Newark, New Jersey, on their low bid of \$117,844.37.

April 13—Route 15, Sections 2 and 3, Bridgeton-Millville, Warrenite Bitulithic on Concrete base, 8 miles, 20 feet wide with gravel shoulders was awarded to the Tri-State Construction Company of Bridgeton, New Jersey, on their low bid of \$455,500.12.

April 14—Route 4, Section 14, Laurelton-Lakewood, 3.875 miles, Reinforced Concrete Paving job, 20 feet wide with gravel shoulders was awarded to C. H. Earle of Hackensack, New Jersey, on his low bid of \$144,705.68.

April 28—Route 4, Section 13, Richmond Ave., Point Pleasant Beach, Reinforced Concrete paving job, 0.848 miles, 20 feet wide with earth shoulders was awarded to C. H. Earle of Hackensack, New Jersey, on his low bid of \$35,471.76.

May 16—Route 4, Section 15, Lakewood (County section) 2.556 miles Reinforced Concrete Paving job, twenty-eight and thirty feet wide, was awarded to the Public Service Production Company of Newark, on their low bid of \$75,748.82.

May 16—Route 4, Section 15, Lakewood (Township Section) 2.556 miles, Reinforced concrete paving job, 36 and 50 feet wide was awarded to C. H. Earle of Hackensack, New Jersey, on his low bid of \$105,741.10.

May 23—Route 6, Section 12, East Commerce Street, Bridgeton, 1.314 miles long. Sheet Asphalt paving job on Concrete Base, 20 and 32 feet wide, was awarded to E. R. Mixner Co., on their low bid of \$80,422.01.

May 26—Route 9, Section 8, North Branch-Somerville, 3.837 miles, Reinforced Concrete paving job, 20 feet wide with earth shoulder was awarded to Ralph Sangiovanni, on his low bid of \$159,077.59.

May 26—Route 16, Section 3, Bedminster-Pluckamin, 2.415 miles Reinforced Concrete paving job, 20 feet wide with earth shoulders was awarded to Ralph Sangiovanni, on his low bid of \$135,648.39.

May 26—Route 4, Section 16, Maine St., Toms River, 1.096 miles long, Reinforced Concrete paving job, 20, 30, 36, 38 and 56 feet wide with gravel shoulders was awarded to the Public Service Production Company of Newark, on their low bid of \$62,864.59.

June 2—Route 5, Section 9, Barkers Corner-Hacketts town, 2.99 miles Reinforced Concrete paving job, 20 and 48 feet wide with earth shoulders was awarded to Frank J. Groman, of Bethlehem, Pennsylvania, on his low bid of \$230,274.37.

June 6—Route 2, Section 3-A, Whitehorse-Crosswicks Creek, 0.189 miles, Reinforced Concrete paving job, 30 and 40 feet wide was awarded to Daniel Klockner, of Trenton, New Jersey, on his low bid of \$37,172.82.

Jan. 10—Route 6, Section 8, Pearl St., Bridgeton, Reinforced Concrete paving job, 0.455 miles, 20 and 30 feet wide with gravel shoulders was awarded to the Tri State Construction Company, Bridgeton, New Jersey, on their low bid of \$76,302.36.

April 5—Route 4, Section 10, Shadow Lawn Roseld Avenue, Sheet Asphalt Paving job on Concrete Base, 2.41 miles, 20 and 36 feet wide with earth shoulders, was awarded to Newark Paving Company, of Newark, New Jersey, on their low bid of \$104,969.51.

April 4—Route 2, Section 3, South Broad Street, Sheet Asphalt job, on Concrete Base, 0.648 miles, 48.5 feet wide, was awarded to J. J. Barrett, Trenton, New Jersey, on his low bid of \$69,433.77.

March 1—Route 11, Section 1, Main Street, Passaic, Sheet Asphalt job, on Concrete Base, 0.257 miles, 22 feet, 2 inches wide, was awarded to Union Building Construction Company, Passaic, New Jersey, on their low bid of \$15,160.15.

April 5—Route 4, Section 12, Sea Girt Avenue, Reinforced Concrete Paving job, 0.162 miles, 20 feet wide with earth shoulders was awarded to T. H. Riddle, New Brunswick, New Jersey, on his low bid of \$8,569.23.

April 4—Route 9, Section 6, Somerville-Bound Brook, Reinforced Concrete Paving job, 2.491 miles, 20 feet wide, earth shoulders was awarded to Salmon Brothers, Netcong, New Jersey, on their low bid of \$131,710.10.

March 31—Route 4, Section 5-A, Storm Drain in Red Bank, was awarded to Chas. J. Romano, Montclair, New Jersey, on his low bid of \$15,314.85.

April 10—Route 6, Section 9, Salem-Collier's Run, Reinforced Concrete Paving job, 4.752 miles, 20 feet wide with gravel shoulders was awarded to Sampson & Reuter, Elizabeth, New Jersey, on their low bid of \$196,975.08.

April 18—Route 9, Section 5, Union Avenue, Bound Brook, Sheet Asphalt on Concrete Base, 1.501 miles, 20 feet wide with earth shoulders was awarded to the Utility Construction Company of New Brunswick, New Jersey, on their low bid of \$93,090.31.

April 10—Route 3, Section 8, Camden-Clements Bridge Road, Reinforced Concrete Paving job, 3.82 miles, 36 and 40 feet with earth shoulders was awarded to W. Penn Corson, Camden, N. J., on his low bid of \$269,644.85.

April 10, Route 3, Section 9, Clements Bridge Road-Kirkwood, Reinforced Concrete Paving job, 3.756 miles, 29 feet wide with earth shoulders was awarded to John M. Kelley Construction Co., Camden, N. J., on their low bid of \$200,592.95.

April 10—Route 3, Section 10, Kirkwood-Berlin, Reinforced Concrete Paving job, 5.576 miles, 29 feet wide with earth shoulders was awarded to John M. Kelley Construction Co., Camden, N. J., on their low bid of \$297,993.89.

May 29—Route 9, Section B, West Front Street, Plain-



# The Highwayman

field, Sheet Asphalt paving job on Concrete Base, 1.929 miles, 40 and 41 feet wide, was awarded to the Union Paving Company, of Newark, New Jersey, on their low bid of \$219,316.20.

June 20—Route 1, Section 6, Trenton City Line-Nottingham Way, reinforced concrete paving job, 0.928 miles, 39 feet, six inches wide, was awarded to Rees and Taylor, of Trenton, New Jersey, on their low bid of \$95,347.47.

June 21—Route 4, Section 5-A, Maple Avenue, Red Bank, Sheet Asphalt paving job on Concrete Base, 1.308 miles, 40, 33 and 22 feet wide with earth shoulder was awarded to J. J. Barrett, of Trenton, New Jersey, on his low bid of \$93,429.13.

June 21—Route 4, Section 11, Main Street, Avon, New Jersey, Warrenite Bitulithic surface on Concrete Base, 0.663 miles, 43 feet wide with earth shoulders was awarded to the East Jersey Bridge Company, of Perth Amboy, New Jersey, on their low bid of \$54,814.34.

June 21—Route 5, Section 6, Speedwell Avenue, Morristown, Warrenite Bitulithic surface on Concrete Base, 1.426 miles, 23 feet, 3 1/2 inches wide was awarded to J. S. Geiger Sons of Newark, New Jersey, on their low bid of \$144,892.74.

June 21—Route 9, Section 9, Phillipsburg-Still Valley, Reinforced Concrete paving job, 1.68 miles, 20 and 36 feet wide with earth shoulders was awarded to Crilly and Cannon of Phillipsburg, New Jersey, on their low bid of \$110,345.40.

July 7—Route 4, Section 17, Barnegat, Reinforced Concrete job, 1.0 miles, 20 feet wide with gravel shoulders, was

awarded to the Public Service Production Company of Newark, New Jersey, on their low bid of \$43,931.94.

July 7—Route 4, Section 18, Tuckerton, Reinforced Concrete job, 1.5 miles, 20 feet wide with gravel shoulders, was awarded to the Public Service Production Company of Newark, New Jersey, on their low bid of \$59,913.83.

July 13—Route 9, Section 7, Main Street, Somerville, Reinforced Concrete job, 0.497 miles, was awarded to J. L. Bachman of Linden, N. J., on his low bid of \$74,180.25.

July 14—Route 16, Section 2, Mine Mount Road-Bedminster Corner, Reinforced Concrete job, 2.515 miles, was awarded to the Engineering Construction Corporation, Philadelphia, Pennsylvania, on their low bid of \$166,802.65.

July 14—Route 1, Section 13, Highland Park-Stelton Road, Warrenite Bitulithic on Concrete Base, was awarded to S. S. Thompson & Company, Incorporated, Red Bank, New Jersey, on their low bid of \$305,394.61.

July 14—Route 1, Section 14, Stelton Road-Metuchen, Warrenite Bitulithic on a Concrete Base, was awarded to S. S. Thompson & Company, Incorporated, Red Bank, New Jersey, on their low bid of \$344,784.65.

July 14—Route 9, Section 9A, Still Valley-Bloomshury, Reinforced Concrete job, 2.92 miles, was awarded to Bernard E. Tighe Construction Company of Easton, Pennsylvania, on their low bid of \$127,785.84.

July 21—Route 5, Section 8, Great Meadows-Barker's Corner, Reinforced Concrete, was awarded to Salmon Bros., Netcong, New Jersey, on their low bid of \$186,688.69.



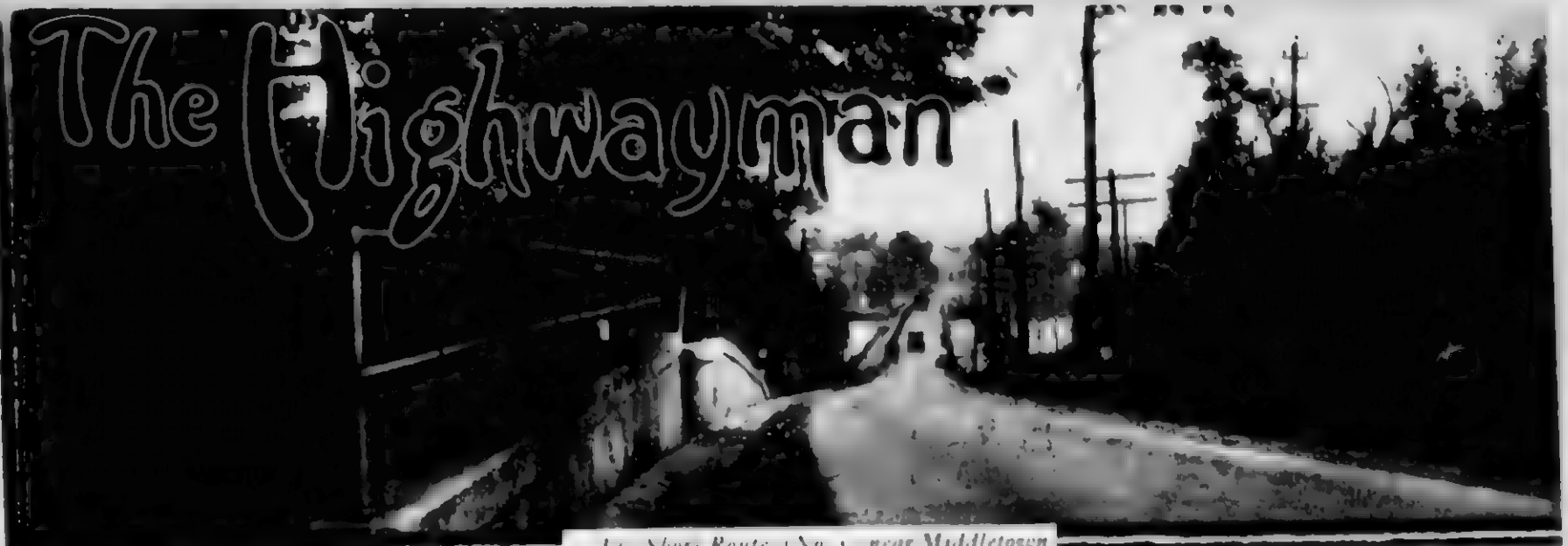
## For You— "The Highwayman"

Do you use roads? Do you want to know where they are being built, and what detours to take, each month.

Then send, TODAY, to

**The Highwayman**  
New Jersey State Highway Department  
Trenton, N. J.

Just ask to be put on the Highwayman's list. A postal will do.



October 1922

**The Highwayman Is Out  
For More and Better Roads  
in New Jersey**

Vol. II No. 3



A sketch map which indicates how the Lincoln Way, "The Main Street of America," correlates a vast number of important highways and serves as the great central main line for through traffic—the backbone of a national highway system



## The Greatest Road System In The World--And You

I do not know the name of the man who built the roads of Rome.

But what he did was greater than the work of Caesar's conquering armies. Perhaps there will yet be a monument built to him, after the last of the captains and the kings depart, and the tumult and the shouting dies away, and we finally get down to the world-wide worth-while job of letting everybody earn a decent living in peace.

In the meantime, let us congratulate ourselves that we live in a country that is at least saner than most of the rest of the world.

A country which has had common-sense enough to go ahead, in spite of the generally upset condition of the world, and build the greatest road system ever dreamed of in man's history—a net-work of highways, thousands upon thousands of miles, tying every State in

the Union to every other State, doing more than anything else has ever done to make a really united Nation economically and socially.

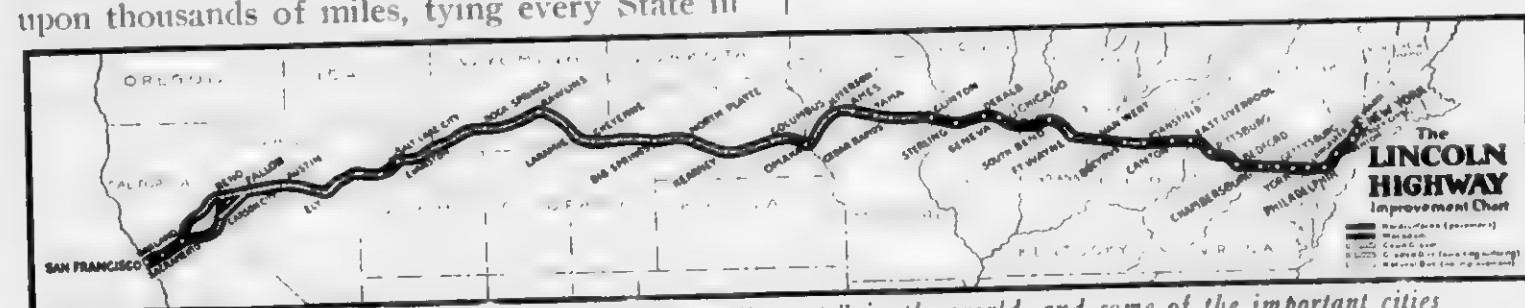
The day has come when that State which has not provided itself with an adequate road system, is linked up as backward and second-class.

There is no State in the Union where the need for first class road service is more vital than it is in New Jersey. Let us be satisfied with nothing less than a state road system that is second to none in the country.

The better the road system we build now, the greater will be the opportunities for our State tomorrow.

But it's up to you.

*The Highwayman*



The famous "Lincoln Highway", the longest highway "route" in the world, and some of the important cities through which it passes—(Maps by courtesy of "Motor.")

# The Highwayman of New Jersey

3

## The Highwayman

Published Monthly By The  
State Highway Department, at Trenton, N. J.  
The HIGHWAYMAN will be sent free upon application  
to any citizen of New Jersey who is interested in  
"More and Better Roads For New Jersey!"

### THE HIGHWAYMAN

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#### Associate Editors

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C. F. BEDWELL EDWARD E. REED  
CHAS. FISHBERG

Managing Editor  
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6th Vice President - - - - - H. D. ROBBINS, Construction  
Executive Secretary - - - - - EDWARD W. O'BRIEN

### An Article Worth Reading

In this issue of THE HIGHWAYMAN, you will find an  
article by Colonel Stevens, who was formerly Commission-  
er of Public Roads for the State of New Jersey.

This article is at the same time, one of the most inter-  
esting and one of the most unusual things you have ever  
read. The matters of which Colonel Stevens writes  
concern every citizen of this state, no matter what his  
business may be. Every word of this article, which is as  
interesting as fiction, you should read, then study the  
charts and tables which show in actual records what has  
happened since Colonel Stevens made his remarkable prop-  
hecy. We believe that no man with common sense can  
do this without seeing the absolute necessity of our having  
a systematic, adequate, planned-in-advance program for  
the development of the road system of our State.

### If You Want to Continue to Receive the Highwayman Renew Your Sub- scription Now

The demand for the HIGHWAYMAN, by the road users  
of the State, has been so great that it has required several  
increases in circulation. We can continue to send it only  
to those who are really interested.

If you wish to continue to receive THE HIGHWAYMAN,  
fill out and return to us the enclosed self-addressed post-  
card before November 1. Names which have not been  
renewed in this manner by this date, will be dropped from  
our list.



Mr. Jacob Hagin

Superintendent of Plant and Equipment

Jacob Hagin, known to most of us as "Jake", was  
born in Albany, New York, on Christmas Day, 1884, al-  
most 'neath the shadows of the capitol building of that  
great state. When he was five years old "Jake" decided  
to try his luck in "Jersey", and so in 1889 he moved his  
family to this State.

He obtained his preliminary education in the schools of  
Elizabeth, N. J., and later attended Columbia University,  
graduating from that college in 1903.

In 1908, Mr. Hagin became connected with the auto-  
mobile industry and has remained in that business ever  
since. He first became affiliated with General Motors at  
Flint, Mich., representing several lines of cars under con-  
trol of that corporation. He has at various times been  
connected with the factories of the Buick, Oldsmobile,  
Cadillac and Chevrolet Motor Companies.

On October 1, 1920, Mr. Hagin became connected with  
the State Highway Department, as Supt. of Plant and  
Equipment, which position he now holds.

We tried to find out from "Jake" just how important he  
was, because, as every one knows, the Equipment Division  
has a tremendous job on its hands. One might expect the  
head of the Division to feel somewhat proud of his accom-  
plishments. "Jake" says: "There ain't no such thing as  
my accomplishments, it's OUR accomplishments. Full  
credit must be given to the team work of the men working  
with me."

Mr. H. C. Shinn,  
Engineer of Special Assignments,  
Trenton, N. J.

August 21st, 1922.

Dear Sir:—Colonel Stevens' article on "The Future of  
Good Roads in State and Nation" impressed me so greatly  
at the time of its first publication in *Scribner's Magazine*  
that I saved a copy of the magazine.

Many of the thoughts expressed are now a matter of  
common practice and thought with Highway officials  
throughout the country. My object in desiring this article  
re-printed is that the people may become impressed with  
the wisdom of taking seriously and profiting by the work  
of men of the type of Colonel Stevens, so that the progress  
of Highway construction may keep abreast of the growing  
needs of traffic.

If we would face conditions fairly and honestly, and  
analyze the conditions of today in the same manner  
Colonel Stevens did in 1914, and from this analysis make  
a forecast of conditions to be expected eight to ten years  
from now, we could reasonably expect to be abreast with  
our worst traffic needs in the matter of Highway construc-  
tion and maintenance.

Very truly yours,

*Brasler*

State Highway Engineer.



Benj. E. Farrier

Another Member of your Highway Commission

Benjamin E. Farrier was born in Jersey City, N. J., on  
May 22, 1879. He got his early education in Public  
School No. 3 of that City, later attending Hasbrouck's Insti-  
tute and Drakes Business College. When eighteen he en-  
tered the plumbing and heating contracting business of his  
father, William W. Farrier. This firm was established  
in 1886 in Jersey City, and has done a great amount of  
the largest installations of work in that line in the indus-  
trial and public buildings of that city.

Mr. Farrier is active in Chamber of Commerce affairs  
in Jersey City. He served on the Board of Direction for  
eight years, and as Chairman of the Entertainment Com-  
mittee for the same length of time. He has been active  
in the automobile club of Hudson County, and an enthusi-  
astic motorist for many years. The Rotary Club of Jersey  
City, a popular member of the Carteret and Down-Town  
has served on the Board of Directors and was elected  
President of that Club in 1921.

Fraternal organizations in which he is interested are  
the Elks, and the Jersey City Lodge of F. & A. M. He is  
also a member of the Master Plumbers Assn., of Jersey  
City; a popular member of the Carteret and Down-Town  
Clubs, also of that city; and President of the Knockers  
Club of Jersey City.

He is an ardent exponent of Sir Isaac Walton, as he  
has represented the Belmar, N. J., Fishing Club as Presi-  
dent for the past three years.

In financial circles he is a member of the Board of  
Directors of the New Jersey Title Guarantee & Trust Co.  
"Big Ben", as he is called and known by his friends in  
Jersey City, is married, and has four children. He has  
travelled extensively in this country, Canada, British  
Columbia, Alaska and Mexico, and has always been a  
keen advocate for good roads and road improvement.

Mr. Farrier was appointed a member of the State High-  
way Commission July 27, 1922.

### When You Think of St. Valentine Plan For That Big Convention

If you are one of those who missed out on last year's  
Highway Department convention, you want to get busy  
right now and make your plans to attend the convention  
which will be held this year.

The date has been set for February 14—St. Valentine's  
Day—to February 17, inclusive. Put this down in your  
little notebook as "Highway Convention Week."

A. Lee Grover, chairman of the committee on arrange-  
ments, and the Secretary, Mr. Charles Fishberg, are plan-  
ning to make this year's convention an even greater suc-  
cess than last year's. We'll say that they have some job  
on their hands to succeed in doing that! If you want to  
know more about what is going to happen, ask either Lee  
or Charlie.

If you happen to be a manufacturer or dealer in high-  
way equipment or material, just keep in mind that it's  
going to be "first come, first served." This year, one of  
the big features of the convention will be the exhibits of  
equipment and material. Spaces are being allotted in the  
order of application. A word to the wise is sufficient!

### NEW JERSEY STATE HIGHWAY DEPARTMENT

August 1, 1922

Executive

Hon. EDWARD I. EDWARDS, Governor  
The State Highway Commission

and  
THOMAS J. WASSER, State Highway Engineer  
ADMINISTRATION

A. LEE GROVER, Secretary and Chief Clerk

M. L. HOWELL - - - - - Chief Auditor and Accountant  
CHAS. FISHBERG - - - - - Assistant Chief Clerk  
R. W. WILDBLOOD - - - - - Purchase Clerk  
MISS GRACE WILLIAMSON - - - - - Chief File Clerk

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G. R. MOORE, Asst. Construction Engineer

R. A. MEEKER - - - - - Right of Way Engineer  
JOHN L. VOGEL - - - - - Bridge Engineer  
THOMAS GEORGE - - - - - Supervisor of State Labor  
C. A. BURN - - - - - Northern Division Engineer  
H. D. ROBBINS - - - - - Central Division Engineer  
J. A. WILLIAMS - - - - - Southern Division Engineer  
L. F. HALL - - - - - Chief Draftsman

#### PROJECTS DIVISION

EDWARD E. REED, Assistant State Highway Engineer  
A. D. BULLOCK - - - - - Projects Engineer  
H. C. SHINN - - - - - Engineer of Special Assignments

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E. D. WOODRUFF - - - - - Assistant Supt. of Maintenance  
E. M. STORER - - - - - Chief Inspector

#### EQUIPMENT DIVISION

JACOB HAGIN, Superintendent of Plant and Equipment  
N. C. APPLEGATE - - - - - Asst. Supt. of Plant and Equipment  
J. J. TYMAN - - - - - Asst. Supt. of Plant and Equipment  
F. M. DEVEREUX - - - - - Asst. Supt. of Plant and Equipment

#### TESTING LABORATORY

R. B. GAGE, Chemical Engineer  
J. G. BRAGG - - - - - Senior Testing Engineer  
F. H. BAUMANN - - - - - Senior Testing Chemist

### Again This Year—The Snow Must Go

Probably no work done by the Highway Department  
last year was of greater immediate service to the road-  
using public than the "Snow Removal" program that was  
carried through so successfully.

This was made evident by the large number of letters  
we received commending the work, and hoping that it  
would be continued.

It will be continued. The same volunteer organization  
of employees of the Department, with the co-operation of  
the Contractors, will handle the snow removal work this  
coming winter.

The Works Committee meeting of August 28 started a  
discussion of Snow Removal subjects and it was decided  
to start preparation of organization charts in the near  
future, in order that everything may be in readiness when  
the snow comes.

Men who have joined the Department on a monthly  
basis this year, it is expected, will join in the work with  
the same spirit and enthusiasm as others who have been  
tried by the fire, that is to say, snow.

August 21st, 1922.

Mr. Hickey,  
Master Mechanic of the Mouth-organ Gang.

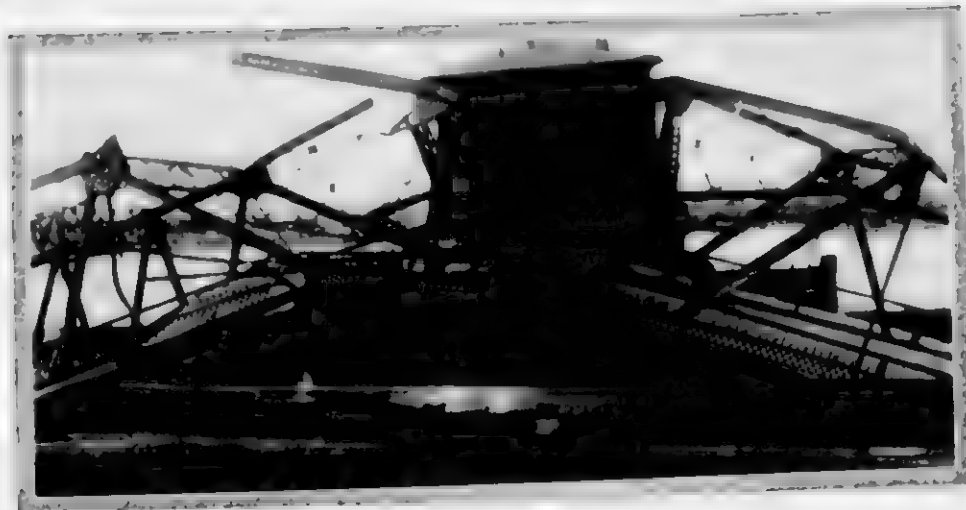
Dear Sir:

Very truly yours,

"Buck" Reading.  
"alias" WILLIAM B. READING.



# The Highwayman of New Jersey



This is how the remains of the Hackensack River bridge looked after it was "rammed"

## Hackensack River Bridge

By JOHN VOGEL, Bridge Engineer

On June 22, 1922, at 8.15 A. M., the steamer "Glendaniel", shown on page 5, collided with the open draw-span of the Hackensack River Bridge located on State Highway Route No. 1 (the Lincoln Highway) between Jersey City and Kearney, shoving the bridge eight and one-half feet off center and resulting in its complete destruction, as is clearly shown above. This road is one of the most heavily travelled highways in the country and the traffic shut off, as a result of this accident, was forced to detour via the Newark Turnpike, located about one and one-half miles north of Route No. 1, and the only other means of travel between Jersey City and Newark. The congestion which resulted from the diversion of this large amount of heavy traffic can only be appreciated by those who were unfortunate enough to have to make this detour.

On July 1st, 1922, the State Highway Commission was to take over Route No. 1 (the Lincoln Highway) through Newark to Macy Avenue, Jersey City, including the Passaic River and Hackensack River Bridges. The State Highway Engineer, realizing the seriousness of this accident, immediately brought the matter to the attention of the Commission. On June 29th action was taken by the Commission for the construction of a temporary bridge at this point, in order that the congestion of traffic on the Newark Turnpike might be relieved. The same day the survey and plans for this work were actually started. The contract was awarded to the Stillman, Delehanty and Ferris Company, and on July 3rd, 1922, their equipment arrived on the job. Due to the fact that July 4th was a holiday, work did not actually start until the following day. Meanwhile, application was made to the Board of Commerce and Navigation, of the War Department, for a permit to construct this temporary bridge. After a great deal of consideration and study, it was decided to construct this temporary bridge about 150 feet north of the present bridge. This would allow the reconstruction of a perma-

nent bridge without offering interference either to the construction work or to traffic using the temporary structure. The temporary bridge now under construction will consist of pile trestle approaches, with a swing steel draw-span over the channel, which will provide for a 75 ft. clear opening on one side and a 68.6 ft. clear opening on the other, as required by the War Department. This bridge will have a 24 ft. clear roadway, with a 7 ft. sidewalk on one side. Provisions are made for two lines of trolley traffic and heavy motor trucks.

The progress made in the construction of this temporary structure may be seen by referring to Fig. 3, which shows the east approach and Fig. 4, showing the west approach. Practically all of the work shown in these pictures was done in 13 days. Attention is also called to Fig. 5, which shows the west approach, where it joins the present highway, and Fig. 6, showing the east approach, indicating clearly the easy grade and alignment over this structure.

Before any work could be done toward the removal of the damaged portion, it was necessary that proper legal action be taken. When Route No. 1 (the Lincoln Highway) was taken over on July 1st, the State did not take over the old Bridge due to the litigation which had been started by the two counties against the Steamship Company. It was not until about August 11th, after the Engineers representing the interested parties had completed their survey of the damaged bridge, that orders were given the contractor to start removing the damaged draw-span.

On September 3, 1922, the northerly half of the damaged draw span was practically removed, which also included the center bay of the draw, including the engine house and supports. In order to remove the lower part of the north half of the draw, a 100 ton derrick of the Merritt Chapman Company was used, as the old steel was tightly wedged in the old fender system. It was necessary that the north half of the damaged span be removed in order that the center pier and fender racks for the temporary draw could be constructed.



Reconstruction of the Hackensack bridge (left) Fig. 3 showing progress being made on the east approach of the temporary bridge; (right) Fig. 4, and also the progress being made on the west approach.



The steamer "Glendaniel", which collided with the bridge

## A Letter That Speaks for Itself

Phila., Pa., Aug. 15, 1922.

Mr. R. B. Gage,  
Chemical Engineer,  
Quarry & Taylor Place,  
Trenton, N. J.

Dear Sir:—I hereby report a collision between motorcycle No. 6-10 New Jersey License C—, 1922, operated by me, and a fence post on the property line of the Texas Company, Marcus Hook, Pa., with the resulting damage to the motorcycle of one badly bent front fork and mud-guard, and possible internal injuries. I was fortunately entirely unhurt. The fence post is a total loss, being sheared off even with the ground.

The accident was caused by a bump in the road, which threw my side-car in the air, due to the road curving at that point. Before I could recover my equilibrium, I had hit the post.

After three hours' work with the assistance of one man and an oxy-acetylene blow-torch and one dollar and a half (for the assistance of the man) I was enabled to return to the city.

We could not entirely straighten the fork, and as a result the machine has a tendency to steer to the left, and it is impossible to assemble all parts as they should be.

The machine should not be used until repaired. It can be run, however, and I await instructions when to bring it to Trenton.

In addition to the above, the front license was torn off, the left grip (handle) was likewise removed, and the front tire punctured.

A new front fork and a thorough inspection are practically all it needs.

I would appreciate very much having another effort made to secure for me a Ford or Dodge.

Yours very truly,  
Inspector.

## "A Message from the Chief"

The Highwayman has served its mission. In order to continue, it will be necessary to charge for subscriptions at the rate of \$1.00 per year in advance. If sufficient subscriptions are received dating from January 1 next for the year 1923, the magazine will be continued. If not, its publication will be suspended. Should the publication be suspended, all unexpired contracts for advertising will be adjusted, and all subscriptions which have been received will be refunded.

(Note: this notice will replace the announcement made on page 2, of this issue, under the heading, "If You Want to Continue to Receive the Highwayman Renew Your Subscription Now.")



Progress has also been made on the new permanent bridge, as shown in the photographs above; (left) Fig. 5, showing the easy grade and the alignment over the new structure and (right) Fig. 6, the west approach where it joins the present highway

# The Highwayman of New Jersey



**The Late Col. Edwin A. Stevens**  
Former Commissioner of Public Roads of New Jersey



The Colonel at work. Colonel Stevens was not only tremendously interested in highway matters in his own State, but he was a deep student of highway transportation problems and their relation to industrial and social economics. No one can read this article of Colonel Stevens without stopping to think what our highway needs will be five or ten years from now, and to see the vital necessity of preparing in advance to meet them.

## A Prophecy That Has More Than Come True

In 1914 Edwin A. Stevens, Commissioner of Public Roads of New Jersey, wrote an article which was published in the February, 1916, issue of Scribner's Magazine, on "The Future of Good Roads in State and Nation."

Colonel Stevens, during his term of office as Commissioner of Public Roads, became well known throughout the State, and by a number of serious minded persons was considered to be quite visionary. There is no doubt but that the article above referred to, written by him, was considered at that time, proof that he was a rank visionist. However, time has proven quite the contrary, and upon analyzing the conditions of today and comparing them with such a prophecy as Colonel Stevens wrote, one becomes more impressed with the fact that "A pound of foresight is worth a ton of hindsight." We will quote herewith from the article above referred to:

"In no country has the growth of the highway problem in importance and in difficulties been greater than in the United States, and in none does it seem likely to be greater

in the future. Our motor-vehicle registry is already the largest in the world.

There appears to be no near limit to the ingenuity of automobile designers, to the enterprise of manufacturers, nor to the capital that is being poured into the business.

The effect of these industrial phenomena on our roads is worthy of most careful thought. The problem in its most simple and general statement is one of transportation. The cost of transporting one ton a mile at any given speed will divide itself naturally into two parts: first, the cost of providing and running the vehicle, including upkeep, fuel and lubricants; second, the cost of providing and maintaining the roadway in such shape that the sum of both parts of the cost of transportation shall be a minimum. The latter is the special province of highway administration. To discharge this duty, provision must be made for the future traffic.

To do this intelligently we must form some idea of the traffic of today and of its past growth. The horse-drawn

traffic is practically unknown; it will probably not show any material increase through the needs of many industries. It is not, however, a serious problem in the case of our road surfaces.

*Forecast of Automobile Registration Based on Statistics of 10 States*

The following statistics as to automobile registration in ten States that have undertaken the systematic improvement of their roads affords a means of estimating what is to be expected within the next few years for this item:

average cost of \$8,000.00 per mile in estimating the total cost of an adequate road system for the country. In saying that these figures do not overstate the case, he was certainly far on the safe side, because a modern road of sufficient width for two lanes of traffic runs at an average cost of \$25,000.00 per mile today. The more durable road surface pavements now cost on an average of \$20,000.00 per mile today, except in unusual cases where special materials are used on a very short stretch near the source of supply. It would hardly be possible to build any sort of a road today to accommodate two lanes

Motor Vehicle Registration and Population

State	1910	1911	1912	1913	1914	Estimated 1915	Population 1915	Inhabitants per Motor Vehicle
Massachusetts	31,360	38,907	50,432	63,000	77,246	99,000	3,700,000	37.4
Rhode Island	5,911	7,000	9,000	11,512	14,510	18,600	618,000	39.6
Connecticut	11,789	16,372	21,371	27,800	32,700	39,000	1,235,000	31.6
New York	62,655	81,999	105,749	131,918	168,428	222,000	10,300,000	46.4
New Jersey	49,478	55,913	64,117	74,000	87,910	91,500	2,960,000	32.4
Pennsylvania	37,180	48,108	65,519	86,841	125,189	180,000	8,500,000	47.3
Maryland	75,000	72,731	9,749	12,007	20,248	33,000	1,350,000	40.9
Virginia	42,800	4,020	5,710	9,023	13,084	22,000	2,180,000	99
Ohio	12,000	45,788	63,124	86,156	122,504	184,000	5,100,000	27.7
Illinois	410,000	42,615	77,250	106,849	145,092	190,000	6,100,000	32.1
Totals	208,173	350,000	463,378	599,133	799,811	1,076,100	42,043,000	39

\* Part of year. † Estimated. Average.

At the date of writing, the figures for 1915 can be closely estimated. The conditions in the States chosen may not today be representative of the whole country. In those States, however, where little or no road work has been done, registration will take sudden increases, when good roads become available, as shown for Virginia and Illinois.

The ten States named register today over 1,000,000 of the 2,000,000 cars usually accepted as the number owned at this time in the country at large. I estimate for them a possible total automobile registration of 3,300,000 in 1920, and for the country from 6,000,000 to 6,500,000. To check this estimate we may use the figures of automobile output. These, as generally given, will not plot in any fair curve, but the conclusion seems warranted that an output of 2,350,000 may well be obtained by 1920. Men well posted in the business estimate that within a short period a market can be made for from 1,640,000 to 3,800,000 cars a year. For our present purpose we must make some allowance for a rapidly growing export trade.

If the average life of a car be three years, it seems possible that by 1920 we shall have on our highways a total of not less than 6,000,000 motor-vehicles, or one for every twenty inhabitants. This is about three times our present registration. In the ten States the increase in five years has been fourfold. Massachusetts registered one motor-vehicle for every 108 persons in 1910, and one for every 37.4 in 1915. In 1910 the population per car in Ohio was 149; today it is 27.7.

(From the chart shown herein taken from the United States Bureau of Public Roads, it will be seen that the total automobile registration in the U. S. for 1920 was 2,232,000, even exceeding the estimate of Col. Stevens by 50%, and for 1922 it was 3,040,000.)

### Future Mileage of Improved Roads

To care for this traffic we have in the United States about 2,125,000 miles of country roads, not counting streets. What mileage has been improved it is impossible to say, for the word has no standard meaning. We are probably safe in assuming that for a satisfactory system not less than 1,250,000 miles of road must still be improved. With the ever-growing traffic and with the consequent demand for better construction, the ultimate cost of this system will not fall short of \$10,000,000,000, and its construction will probably cover a period of not less than forty years. These figures do not overstate the case.

(It will be seen that Col. Stevens has estimated on an

of traffic for \$8,000.00 per mile.)

Many roads have been built and will be built too narrow, too crooked, with excessive grades and inadequate pavements. These should be widened, straightened, regraded, and repaved. They will also have to be provided with bridges designed for the increasing weight of vehicles. However this may be, it seems safe to say that we have a big job on our hands, and that if we are to plan for its execution we must do so in a big way.

### Comparison with European Conditions

One would naturally look for experience to Europe. European conditions and customs are so different from ours that data derived from them are of but limited value. We must remember, too, that they are in a much more backward state of motor vehicle development, even if more advanced in road administration.

However, much or little we may take from them, we shall also have to consider our problem in the light of what seems to be in store for us.

### Saving in Operation of Vehicles Will Build Roads in Three Years

Let us consider the full extent of the problem—what we are now doing to solve it, and what is needed to obtain good roads.

Assuming for a moment that in 1920 we shall have six million motor vehicles and six million teams using our roads, that the motors will average 200 days at 30 miles and the teams 180 days and 15 miles, we have totals of 36,000,000,000 motor vehicle miles and 16,200,000,000 team miles. The difference in cost of operation on an improved as against an unimproved road may be safely put at not less than 6c per mile for both motor and teams. On this basis we would have \$2,200,000,000 vehicle miles at 6c, or \$3,120,000,000—the total yearly saving.

(Considering this estimate on the total yearly saving in cost of operation of vehicles on an improved as against an unimproved road as being equally as conservative as the estimate of the total cost of building an adequate road system throughout the country it will be seen that the yearly saving would in a little over three years pay the entire cost of building a system of good roads.)

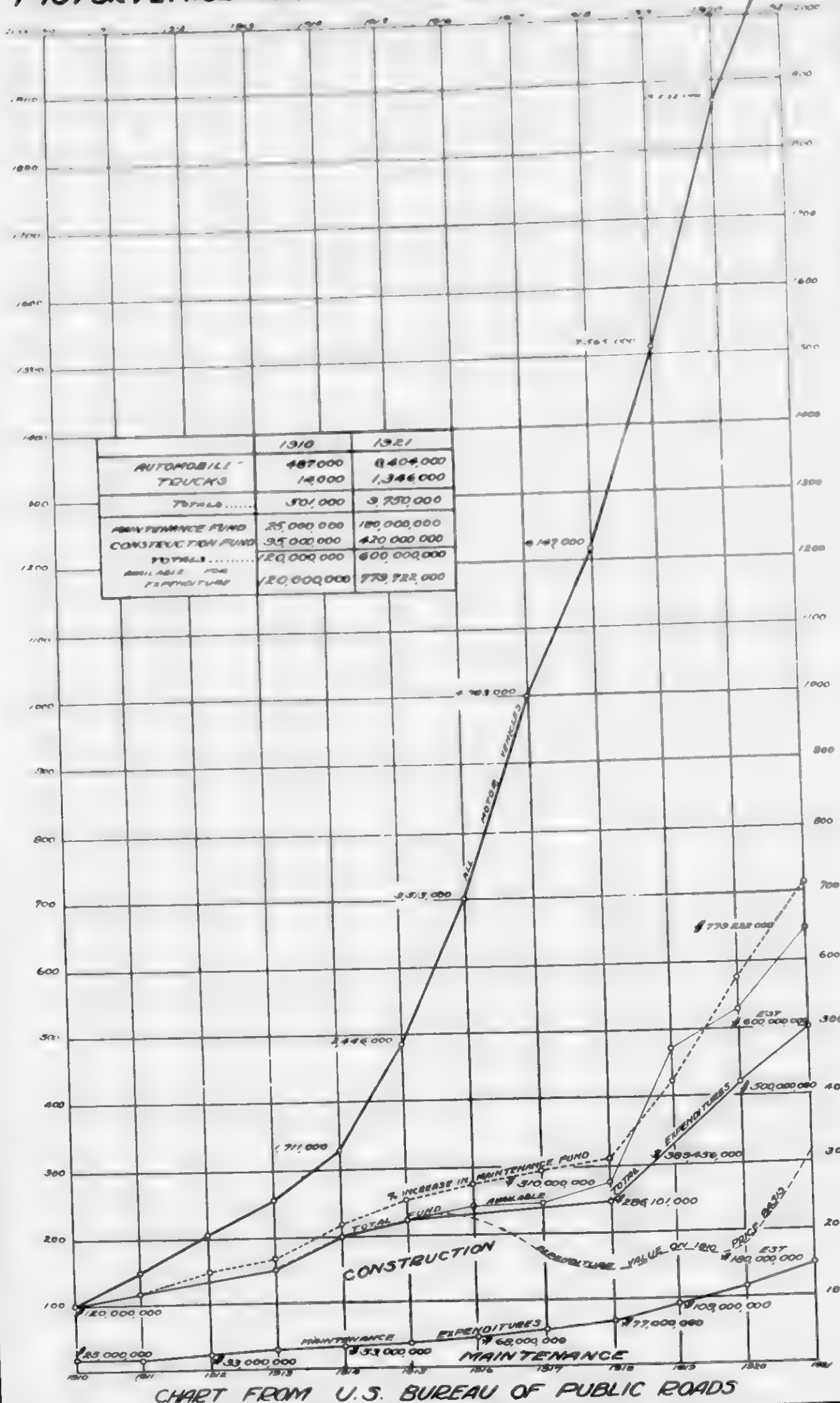
I need only allude to the other gains due to good roads—the opening up of the country, the development of industries, the improvement of the conditions of agricultural life. These cannot be readily estimated in figures, but



# The Highwayman of New Jersey

9

## MOTOR VEHICLE REGISTRATION & HIGHWAY FUNDS



Route 4, between Keyport and Red Bank, between six and seven P. M., Sunday afternoon, August 20

the value is certainly not less than the reduction in cost of haulage and probably exceeds it many fold.

### Road Administration and Organization

The importance of the interest involved would seem to warrant the expense of scientific and business-like administration. Such administration we lack; we seem to have formed but a faint idea of our woeful state of unpreparedness and of the seriousness of the results. Our present methods of road administration are inadequate.

While most of the States have preserved the common law doctrine of the King's Highway, the treatment accorded to our roads has not matched the dignity of their titles. Generally, the roads, except in the case of city streets, are in the hands of some local body or of a turnpike company. The care they have received is such as might have been expected in a community descended from pioneer ancestry. The traditions still survive of the days when each man raised his own food, built his own house, and looked to no policeman to enforce his rights. Any man, in those days, was supposed to be able to build and keep a road, and this belief is by no means dead. It shows itself in the underlying idea of our road administration, the turning over to township committees, selectmen, or by whatever name they may be known, the management of the greater part of our road system. In most of our States we have placed bridges under the care of somebody other than that in charge of the roads.

On this sub-structure many of the States have built, each in its own way, to provide for our increasing highway traffic. The laws passed for this object may be grouped into two general classes, following the lead set by the two States that first took up road improvement as a field for State activities, namely, New Jersey and Massachusetts. The former undertook to aid counties in the building of improved roads, leaving the care of the roads thus built to the county authorities; Massachusetts, on the other hand, set herself to building and maintaining a system of State roads made up of the most important through lines of traffic. Both of these represent correct principles. The State should care for the important through lines. Local bodies should be encouraged to improve roads of secondary importance. Neither of these States, however, undertook to thoroughly provide for the proper care of all of its country roads, nor, as far as I know, has any other State. Nothing less than this will meet the need. Every public road should be insured such intelligent care as to furnish the best service of which it is capable.

My own experience as a road official may be enlightening. A Mechanical Engineer by training, with scanty knowledge of road work, and even less experience in public office, I was appointed, five years ago, head of the New Jersey road department. The appointment, I believe, was considered a good one.

I expected to find very simple engineering, and ill-organized repair system and more or less "graft". I found the engineering by no means simple, that proper reorganization of the repair system would require voluntary co-operation and acceptance of State Control by the Counties, many of which were jealous of each other, and of the influence of the department. I found no real evidence of "graft", and no reason for suspicion against the

force under my control. This force had been formed and had worked under department heads, not one of whom had any previous engineering experience; it was personally well fitted for its work, but hardly large enough for statutory duties and utterly insufficient for the work necessary to insure thoroughness. There was much duplication of work between the State and County forces, and ill-located responsibility. While I cannot complain of any lack of good will, the work has been and is being done under conditions that exclude any high standard of attainment, and with a knowledge that no one expects results to measure up to any such standard.

### Red-Tape and The Difficulty of Making a Legislature Understand Conditions

I may be slow witted, I have had to waste much time in planning how to get the work done under a legislation both unreasonably restricted and often inconsistent, and in learning to tie the red tape thereby required into the regulation bow-knots.

Whatever the cause, it has taken me time to "size up" my ever-growing job, to recognize the underlying causes of our short-comings, and to formulate the principles that must guide any satisfactory reform. I have, in consequence, met with but little success in impressing the need of the service on the people of the State and on the Legislature.

During my term of office almost every one of our neighboring States has changed the head of its road department. This brings us to a most serious defect of our road administration, namely, that the head, whether a commissioner, or a Board, is a political appointee, usually un-skilled in road work and frequently without any engineering training. Holding office for a term of years, subject to great political pressure, and intrusted with wide power, it would, indeed, be wonderful if these men did not frequently yield to considerations other than the best interest of our roads and err by dabbling in engineering matters.

Instead of appreciation of the seriousness and the needs of the situation, one generally finds in our legislatures a faith in the efficiency of certain pet remedies and a leaning to numerous checks, safeguards, and investigation, the outgrowth of lack of confidence in the road administration, fruitful sources of delay, red tape, and waste, and god-sends for the muckraker.

I have never seen a palladium, or if I have, I did not recognize it. It seems, however, that the particular palladium that holds or guards our liberty is likewise the shrine in which we cherish these methods of insuring inefficiency.

Over our road work there is too often cast the baleful shadow of politics. The "scientific distribution of patronage," as it was once described to me by a very earnest, upright, and capable politician, who believes himself a progressive, plays havoc with efficiency. The only refuge seems to be in the civil service, as generally administered, a somewhat cumbersome and usually inelastic method, but still the best now available. Patronage, however, is not the only line along which politics makes its attacks. Roads have been improved or repaired because certain men "with pulls" lived along the line, because certain contractors had plants in the neighborhood for which they wanted



The road is so solid with cars that it keeps a number of

employment, or because some other work of importance could not otherwise get the necessary backing. I am not now alluding to any so-called "graft". This is always hard, generally impossible, to prove. The direct loss therefrom is, I am persuaded, small compared to that due to inefficient administration; indirectly, however, it works immeasurable evil by depriving our road officials of the public confidence they must have if we are to get results. These must be based on personal responsibility enforced by a strict discipline. Responsibility implies power, and power will not be conferred if there be a lack of confidence. This confidence must not be in the individual head only, for he may and will change, but in the organization, and not only in its moral but also in its technical fitness for the work. It must be earned by actual results and cannot be created by legislative enactment. Such enactment, however, is the only means that can create organizations under conditions which will make these results possible. We must look to an awakened public opinion to demand the necessary legislation and a fair chance to "make good" thereunder without unnecessary interference.

#### Comparison of France with Ten Eastern States

I have said that European experience is of but limited value to us in the solution of our problem. The weight given in Europe to the administration of their roads is, however, instructive. The French republic has been the classic example of road administration. It compares with our ten states as follows, the French motor vehicle figures being for the period before the great war:

	Road Mileage	Area	Population	Motor Vehicles
France	357,000	207,000	40,000,000	122,000
Ten States	457,000	261,000	42,000,000	1,076,000

#### French Engineers Work Under Different Conditions Than We Do

In France all national roads and most of the departmental roads are under the care of the celebrated "Ponts et Chaussées" corps. This corps is the best and most thoroughly trained body of civil engineers in the world. Their men are especially trained for the work from boyhood, as are cadets and mid-shipment. Their life work is in the corps. Their instruction covers the engineering, the administrative detail, and the law referring to the subject. The standing of the corps, personally and professionally, is of the highest.

Contrast for a moment our conditions. There is no legal standard of qualifications for an engineer, least of all a highway engineer. The job is seldom permanent. There is but little confidence in the ability, and but too often in the integrity of highway officials. This is hardly to be wondered at when we recall that we are trying to care for a fast-growing motor traffic, today sixteen times that of the French Republic, under the leadership of political appointees holding office for limited terms, and working under laws that make efficiency impossible.

To avoid any misunderstanding as to our highway engineers, let me, in this connection, bear witness to the devotion and ability of those with whom I have been thrown in contact. There are, of course, lamentable exceptions, but as a whole they are morally and technically of higher class than one would expect under the conditions. There

is, however, little organization, no recognized standard of qualifications, and no interstate cooperation. Road societies there are, but these are organized to boost the cause of roads and only incidentally to afford technical training. The lack of data

#### Practical Solution of the Problem

The very evident cure for our present ills and the best provision for the future is such organization as will establish in each State a highway force that will command respect and confidence in its ability. We must then state our problem, and this, too, will generally require legislation. Even in the smallest and in the sparsely settled States the cost and importance of the work will warrant thorough preparatory study. But little of this has been done. We have tackled the job of improving our roads with an insouciance that would be almost laughable if its results were less ominous. Few, if any, States have any accurate idea of their country-road mileage, much less of its proper and economical development, and, I may add, practically none at all of the ultimate cost nor of the duration of the period of improvement. Yet all these can at least be approximately ascertained, and the public which pays the bill is entitled to the information. We are, however, embarked on a programme involving an unknown expenditure for an unknown period, and we do not know what we shall have at the end. If we are to accomplish anything we must "size up" our job and, remembering Davy Crockett's advice before it is too late, be sure we are right before we go much further.

For this purpose we should lay out a road system for each State. Such a system will include roads of all classes. If national roads become a fact they will form a separate class. There will also be the main lines of intra-State traffic, then roads of secondary importance furnishing the principal feeder lines for the State highways and connecting towns of secondary importance, and, lastly, the lesser roads corresponding to the capillaries in the system of blood circulation. Each of these classes will call for different features of design and for different types of paving. For our greatest roads it would seem that the best will be none too good, for the smallest our means will demand that we adopt the most economical construction. Without thorough preliminary study and planning we shall, beyond doubt, build roads, some insufficient for their loads and others more costly than their traffic will warrant. I may here point out that the permanent investment in a road is made up of the cost of the right of way and of grading. Drainage works and foundation courses may be or may not be permanent; the same is true of bridges; but surfaces are never permanent. If, however, we secure enough land and grade it properly at the outset, our investment to that extent is secure. Land can always be had more cheaply before improvement than for subsequent widening and straightening. Regrading disturbs conditions along the road, inflicting at times considerable loss, and disturbs more or less previous work. Hence, it is wasteful and should be avoided by giving location and grading full consideration in the original design. This consideration cannot be given without knowledge as to the importance of the road. Our railroads have found that on main trunk lines it pays to



State patrolmen busy to maintain a clear right-of-way for south bound traffic. You can see why wider roads and wider rights-of-way are necessary

older grades and eliminate curves at almost any cost. *Mutatis Mutandis*, the same is true of the highway.

Our organization should extend to all country roads. Streets present another problem. Just as physically and economically the roads in a State form part of one system, so the State must provide that they be administered under uniform laws and in co-ordination. The public has a right to expect and the State should provide that every road be so kept as to give the best service of which it is capable.

There must be a strict, uniform and scientific system of accounting and audit, including an accurate census of road traffic. The resulting data must be carefully analyzed to enable those in charge not only to make comparisons, but also clearly to account for the discharge of the trust imposed on them.

We must, in all cases, have such elasticity in statutory provisions as will cut the red tape down to a minimum.

The importance of the work to be done will justify provisions that will make highway engineering a career that will attract and hold young men of ability and energy. Material of this character can be trained to high efficiency if politics be excluded, if promotion follow on proven fitness and discipline be rigidly enforced. All higher positions must be filled by promotion so as to exclude dilettanti administration and freak engineering, and provide an incentive to continued effort. A force organized on these lines and public confidence therein are the important matters. Given these, the rest will follow. But such a force in any adequate number does not exist today, and it can only be created by establishing the proper conditions for its development and allowing sufficient time therefor. Even in such a small State as New Jersey, there would be needed for the state-wide oversight of roads more men than are fitted and available for the work. Even if men were available in sufficient numbers, they must be moulded into an organization, a living and growing organism with an "esprit de corps" and traditions.

(Another striking example of the foresight of Col. Stevens is in his statement above to the effect that "such a force in any adequate number does not exist today and it could only be created by establishing the proper conditions for its development, and allowing sufficient time therefor." This statement made at a time when one person in a hundred would not dream that sufficient trained engineers could not be employed to adequately handle the growing needs of our highways. Since that time, however, it has been necessary to do just what was prophesied, that is, to provide the proper conditions to train men in this highly important branch of civil engineering, so that the work would be adequately carried on.)

This will require time. In almost every State that has taken up road-work seriously there is a nucleus around which the force necessary for State-wide administration can be gathered and trained.

#### Road Work Calls For High Standard Engineer

Road-work calls for analytical study requiring the combination of experience, common sense, and technical training. It involves, also, in the higher grades, difficult administrative work, which cannot be readily separated from the engineering and executive ability of no mean

order. This always demands and must receive good pay. A high professional standard for such a force gives the members a pride in their organization and a confidence in its ability to do its work, without which it is useless to expect any full measure of success or of public trust. This latter, I repeat again, is essential to any satisfactory solution of our problem. Without it the public will not insist upon the exclusion of politics from road work, and before they will so insist the people must know that their business is being handled by experts and honest men.

The technical work to be performed by such a body should consist, in addition to the preliminary study needed, for the laying out of road systems, of design, construction, and maintenance.

#### Safety Considerations in the Design of Roads

"Safety First", of which we have heard much of late, needed but little consideration in the road design of the ante-automobile age. Any road was safe enough if it was good enough. Guard rails on high embankments, avoidance of sharp turns at the foot of steep grades, and a little care at approaches to bridges were enough to make a road reasonably safe at the speed and weight for which they were designed, say ten miles an hour and about three tons. It is no wonder that they have become "death traps" when called on to carry traffic at forty miles with maximum load of from 12 to 15 tons. The solution of the guard rail question is yet open. Any obstruction to the view within a distance of from 350 to 400 feet is highly dangerous. Curves on or at the lower end of steep grades, narrowness, excessive crown, unprotected ditches, badly placed trees or poles, and even the pipes often used to carry water across entrances, have become dangers that are taking a heavy toll of human life.

The most apparent dangers on our highways are the crossings over railroad and trolley tracks at grade. The elimination of these death-traps should never be overlooked. The cost of this work will form no small part of our future highway disbursements. Even when elimination is impossible, much may be done to decrease danger at crossings.

#### Design of Roads to Meet Conditions

As to pavements, for minor roads this will always depend on the relative costs of locally available materials. Gravel, oyster-shells, and macadam will probably always be able to provide for a considerable mileage of the lesser roads. Macadam with a blanket coat of tar or asphalt, well maintained, will carry a considerable traffic, but only at a fairly high maintenance cost. For more important roads Portland Cement concrete and bituminous concretes seem the most promising solution. Block pavements, brick, wood, asphalt block, and granite on a concrete base, will be required for the heaviest traffic, and for such grades on bituminous concrete roads as may be found too steep for that material.

Roads must be designed for the speed and weights that will be used on them. Whether there be a statutory speed limit or not, it is not seriously regarded, and will in time probably disappear. Any prudent designer today will count on not less than 40 miles. There is little use in providing a surface suited for such a speed without giving





This will give you some idea of the heavy traffic coming from the shore points north

the corresponding widths and curvatures. Without knowledge of weights to be carried, bridge design is but guess work. Pavements and foundation course must also be suited to the weights to be carried. These should be regulated by legislation, uniform in all the States. The paved way for important roads should not be less than 18 feet on tangents; curves should have radii of not less than 1,000 feet with increased widths of paved surface.

Grades are a matter of both economy and safety; with bituminous surfaces anything in excess of 5 per cent. becomes too slippery for horses; automobiles will also skid dangerously thereon.

#### Road Signs and the Dust Nuisance

Many of the minor appurtenances of our roads deserve and should receive more thorough study than has generally been given them. Road signs, for example, should be legible from whatever side approached. Running beyond a sign before being able to read it destroys, to a great extent, its usefulness, and is a source of actual danger. Dust in excessive quantities is not only a nuisance, but has become a serious danger.

#### Shade Trees and Telegraph Poles

The correct placing of shade trees and the selection of the species used are matter of importance. Trees must not be placed so near the driveway as to be dangerous. The same is true of telegraph poles, sign posts, etc.

#### Consideration of Military Features in Design of Roads

The military features of our roads have been all but entirely overlooked. A few years ago a request for the views and advice of the War Department met with a polite but entirely unenlightening answer. Strategically, roads must connect points of military importance. Tactically they must be designed to carry necessary military traffic. In the light of the experience of the great war, this means that very heavy loads, guns of 6 and 8 inch calibre, heavy motor-trucks, high-speed cars, cavalry and infantry must be accommodated. Less than three lines of traffic will hardly meet with the requirements. Nothing less than thirty feet of graded width will do. Bridges must also be strengthened. It may well be that screening will be required.

#### Keep Cost Accounts

The designer must also carefully weigh the advantages of any proposed feature of design against its cost. He must bear in mind that the total road cost is divided into three parts: interest on the first cost; depreciation and re-keep, including the overhead charges due to administration, use of machinery, and, what is usually called the repair charge, the cost of the actual labor and materials used in repair. What he now has in most cases is the repair charge only, and that without traffic data. This charge may be easily kept low by an expensive construction. It may well be that a low-priced road with comparatively high repair charge will be the cheapest solution. Yet, on the other hand, too cheap a construction is sure to prove wasteful. It can easily be imagined that the designer has ample field in which to show his ability.

We have generally built good roads as far as construction work is concerned. We have probably been a little

too impatient for results and too easy-going to obtain all the accuracy in following a specification that we find abroad. Our inspection, too, in many cases, may have lacked in intelligence and thoroughness, but on the whole we have not done badly in this respect.

The up-keep of our roads has, on the whole, been disappointing. There are, of course, brilliant exceptions. If we are to have good roads we must provide a system that will make good minute defects as soon as they appear. This cannot be done without constant and competent inspection. The best way to provide this service will vary with roads of different materials and subject to different traffic intensities. Whatever method, however, is adopted, the importance of accurate accounting for all maintenance expenditures will remain undiminished. Such accounting in connection with traffic census furnishes the only test of the economy of road types and will supply indispensable data for scientific design. In the analysis of road accounts we must take account of speed as well as weight. As yet the unit giving the proper weight to each of these elements of wear has not been agreed upon. The value of such a unit and of road accounts generally depends, in great measure, on uniformity of method.

#### The State and Federal Co-operation and Co-ordination

Our task is such a huge one that for success we must have team work. Our federal scheme of government is a hindrance in securing the inter-state co-operation that the situation demands. It is not only in the planning of inter-state lines of traffic and in securing uniform laws as to classification of vehicles and regulation of traffic that this need exists. We should have standardization of nomenclature so that, for instance, "improved road" will mean the same thing in Indiana and in New Jersey; standard system of road-signs, standard methods of accounting, standard units of traffic and wear, and, in general, co-operation and co-ordination between our forty-eight State-road forces and the federal government.

That this co-ordination and the leadership needed for any team-work can be supplied only by the general government is, to my mind, the unanswerable argument for federal aid. The gain, by united and concerted effort will be greater than that due to any federal appropriation.

#### The Financial End of Highway Work

The financial problem involved is by no means the least of the many road questions that we must settle. I have already estimated the job as involving 1,250,000 miles of road to be improved at a cost of about \$10,000,000,000, and that it will take forty years to do this work. This is not all we will have to finance. While building and after having finished the work, we shall have to keep up the roads already built. This will involve a tremendous outlay. The present total road repair charge in this country is unknown, but we do know that much of it is wasted on unintelligent work.

Our data are so insufficient that no satisfactory financial plan can be worked out in detail. Let us, however, try an illustration, using for this purpose the above assumptions as to cost and mileage of construction and distributing the work evenly over the estimated period of construction. Let us also assume that we are today spending on the

### FUNDS EXPENDED FOR CONSTRUCTION OF ROAD BED AND INVESTMENT IN MOTORIZED HIGHWAY ROLLING STOCK

TRUCKS VALUED AT \$1500 EACH  
AUTOMOBILES VALUED AT \$750 EACH

1910 I

ROAD CONSTRUCTION \$95,000,000

1910 ■

MOTOR VEHICLE INVESTMENT \$386,250,000

1910-16 ■

INCLUSIVE

ROAD CONSTRUCTION \$1,056,000,000

1916 ■

MOTOR VEHICLE INVESTMENT \$282,250,000

1910-21 ■

INCLUSIVE

ROAD CONSTRUCTION \$2,526,000,000

1921 ■

MOTOR VEHICLE INVESTMENT \$832,200,000

PREPARED BY THE AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS

The rapid increase in motor vehicle investment indicates the need for a continuing highway development program. The U. S. Bureau of Public Roads in 1919, estimated that the highway investment in 1919, compared with 1914, was 174% of the 1914 investment.

road repairs \$150,000,000, and that each new mile of road built will add \$400 a year to our expenditure. Our construction will average 31,667 miles a year and will cost about \$250,000,000. Our repair charge on present roads is, say \$150,000,000. Our yearly increase in repair charge will be 31,667 x \$400.00, or about \$12,500,000. Our first year's outlay would be \$400,000,000.

If we build our average mileage each year, we would have spent in the forty years, about \$26,000,000,000.

We must evidently look to our sources of revenue. Benefits are conferred by road improvement on both the land owner and the user of the road. The former pays through the ordinary tax levy. The latter pays a so-called license fee for his automobile only, and nothing for his horses. It seems rational to look to the business on the roads for part of the cost of building and maintaining them. Let us look for a moment at these costs.

At the prices now prevalent in the North Atlantic States, a mile of macadam road, including a bituminous dressing, can be built for about \$12,000, where the grading and drainage are not excessive; the latter may increase the cost to \$18,000 or more. Such a road can be maintained under an average daily load of 400 vehicles of mixed highway traffic, averaging about 1.7 tons in weight, at a yearly repair charge of about \$600.00 per mile. To this yearly charge should be added about \$200.00 as a depreciation charge to take care of extraordinary repairs, which would be needed about once in every five years. Add also 4% interest on cost, or say, \$500.00, and we have a total yearly cost of \$1,300 a mile. The yearly ton mileage would be 248,000. The cost divided by the ton mileage gives .524 of a cent per ton mile, or 0.89 cents per mile of the average vehicle. An automobile, therefore, making an average yearly mileage of 6,000 to an average weight of 3,400 pounds would receive a road service costing about \$53.40, and would do approximately \$33 worth of damage to roads of this character. For a team, which, with its wagon, averages loaded and light about the same weight and does 1,500 miles a year, the cost of service and damage done would be one-fourth (1/4) of the above. In both cases no allowance is made for speed.

Considering speed as a factor, the figures for automobiles would increase and for the horse-drawn traffic would decrease. There is no question that both classes of traffic receive benefits far in excess of the cost of service. The example chosen may represent heavier traffic and a more costly construction than the average. With lighter traffic and cheaper roads the ton-mile cost will tend to increase. Railroad experience leads to the same conclusion.

Now going back to our very rough estimates as to yearly expenditures, and as to increase in motor vehicles, we should have at the end of five years of our construction a yearly outlay of about \$450,000,000. We should also have about 6,000,000 motor-cars. The horse-drawn traffic, as I have said, is unknown. In New Jersey it seems to approximate about 40% of the total. Remembering that New Jersey is pretty well automobilized, and that many vehicles use more than one horse, let us assume for our present purpose a total of 6,000,000 teams, or say 10,000,000 horses. (In 1914 there were 25,000,000 horses and mules on farms in the United States.) If the average automobile motor rates at 25 H. P. and we tax on H. P. basis at \$1.50 a unit, we should raise from motor vehicles \$225,000,000, and from horses \$15,000,000, a total of \$240,000,000, or almost 55% of our estimated outlay.

Enough has been said to outline roughly, indeed, the many and very serious problems suggested by a forecast of our road-work. The lesson to be drawn therefrom is the need of thorough organization of our road forces and of careful preliminary study. The interests affected are among the most important to the welfare of the nation. The investment will be gigantic in size, but can be made to return a benefit far beyond its cost if we will handle it as a business proposition. If, on the other hand, we rush into work of unparalleled magnitude without adequate preparation, if we continue to intrust its execution to men unskilled in the work, chosen mainly on account of past political services and lacking public confidence, and if we keep changing them as various parties may command popular pluralities, we shall pay the price of our folly.

#### Take Highways Out of Politics as Schools Were

To those acquainted with the political conditions affecting not only our roads, but our whole system of government, the remedy proposed may seem to belong to the land of dreams and ideals. I cannot see why what has been accomplished in removing our schools out of politics and in providing a trained staff and proper material, cannot also be repeated in the case of our roads. I will cheerfully plead guilty to any charge of being a "bull" on the prospects of these United States, and on the ability of my fellow citizens, to organize and put through any job from the Panama Canal up. If, however, I am wrong, if in work of such vital importance we cannot rid ourselves of political interference, if we cannot find ways to do the job thoroughly, it would seem that the time has come for us to admit that, however well our democratic system may have been suited to a small community living under the most simple conditions, it cannot provide the necessary government for a highly organized world power. This I, for one, am not ready to admit.

(The End)

### What the Pennsylvania Railroad Is Doing to Prevent Grade Crossing Accidents

Intensive efforts are being made on the Pennsylvania System to prevent grade crossing accidents in connection with the national careful crossing campaign being conducted during the summer months under the auspices of the American Railway Association.

The object of this campaign is to bring to the attention of the American people the necessity for exercising the greatest possible care to avoid being struck and killed or injured by trains while traveling over highway grade crossings and to impress upon locomotive engineers, firemen, conductors and trainmen, track foremen, crossing

watchmen and all other employees the necessity for doing everything within their power to prevent such accidents.

Approximately 140,000 posters illustrating a grade crossing accident have been distributed for posting along the Pennsylvania System. A million stickers showing a reproduction of the poster will be placed on correspondence sent out from the various offices of the railroad. Lantern slides also have been furnished to motion picture houses to call attention to the objects of the campaign on the screen.

Instructions to officers and employees of the Pennsylvania System state:

"Every available means should be employed to educate automobilists, drivers of other vehicles and foot travelers to avoid death or injury while traveling over highway crossings. At the same time no effort should be spared to see that railroad employees strictly obey the rules and regulations designed for this purpose.

"Thirty out of every hundred accidental deaths on the railroads of the United States in 1921 occurred at highway grade crossings. The fact that there has been no increase in grade crossing fatalities since 1917, is primarily due to the work of the national and local safety councils, safety education in the schools and to the extensive publicity given the safety first movement by newspapers and magazines.

"The checking of reckless driving of automobiles over highway crossings and sending notices thereof to the owners by the railroads has had marked effect in this direction, but the effort already put forth should not only be continued but should be increased to meet the conditions that are developing from day to day."

Special instructions have been issued to officers and assistants in charge of the various departments to check up the observation of safety rules and regulations. Attention of road foremen of engines, trainmasters and assistants, maintenance of way supervisors and others concerned in being called not only to the special rules relating to grade crossings governing train service employees but also to such things as unnecessary obstructions to the view of crossings, condition of the roadway at crossings and locomotive whistles and bells.

## \$341,300,000

### Motor Vehicle Payments Into Public Treasuries in 1921

FEDERAL	
1. Passenger Car Excise Taxes	\$64,388,000
2. Commercial Vehicle Excise Taxes	11,640,000
3. Parts, Accessories, Tires Excise Taxes	39,518,000
4. Common Carrier Tax on Passenger Cars for Hire	1,776,000
	<b>\$117,322,000</b>
STATE	
1. License Fees	\$122,478,000
2. Personal Property Taxes* (38 states and D. of C.)	75,000,000
3. Gasoline Taxes* (15 states)	10,500,000
4. Miscellaneous Taxes* (Motor Transportation Franchise Taxes, Mileage Taxes, Business Taxes on Manufacturers and Dealers.)	5,000,000
	<b>\$212,978,000</b>
MUNICIPAL	
1. Local License Fees* (Wheel Taxes, Motor Fuel Taxes, Motor Transportation Franchise Taxes)	\$11,000,000
	<b>\$11,000,000</b>
<b>Grand Total - - - -</b>	<b>\$341,300,000</b>

\*Comparative estimates based on careful analysis of factors involved. Figure for 1921 year.



In front of Seaview Golf Club, near Atlantic City. (Route 4)

## Warrenite—Bitulithic Pavements Have Stood Up Under Heavy Traffic For 15 Years

The test of the paving is in the riding—and the cost of upkeep. Upon either of these points we invite your critical investigation. Some of the oldest paved roads in New Jersey were laid under the Warren patents. Many of these have been in constant use under heavy traffic for fifteen years. They are still in excellent condition.

"The Best Road You Can Buy Is the Cheapest in the End."

**Warren Bros. Company**  
District Office 50 Church Street, New York City, N. Y.

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ESTABLISHED THIRTY YEARS

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# The Highwayman of New Jersey



NOT merely one improved highway, but a network of smooth, dustless, economical roads—this is "The Magic of Tarvia."

## The Magic of Good Roads--

**H**ALF a century ago the railroads reached out into the wastes of the continent—tapped reservoirs of undeveloped wealth—lifted the pall of isolation from frontier life.

Today improved highways are completing the work that the railroads then began—are doing for individual districts what the railroads did for the country as a whole.

The old-time "isolated community" is rapidly vanishing. In its stead are seen progressive towns and villages—centers of ever-widening circles of business activity. This is the magic of good roads.

Nor are the benefits confined to towns and villages. Good roads make farming more profitable. They bring

to the farmer and his family greater social advantages and better educational facilities. They make farm life more attractive.

Yet with all their blessings, good roads need not be expensive. Whether for residential streets or country highways, Tarvia is the quickest, surest, most economical way to all-year roads, free from mud, dust and ruts and proof against water, frost and traffic. It is a coal-tar product made in grades to meet every road condition.

One Tarvia road in your community will prove to you and your townspeople how good roads, with all their benefits, can be had at low cost.

*Illustrated booklets free upon request*

**Tarvia**  
For Road Construction  
Repair and Maintenance

The *Barrett* Company

40 RECTOR STREET, NEW YORK CITY

C. A. Baker, Jr., . . . No. 323, Closter  
H. M. Smith, . . . No. 96M, Riverton  
C. C. Randolph, . . . No. 2466, Plainfield  
Ashley Burner, . . . No. 2232, Plainfield

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## Four Reasons Why All Gravel Roads Should Be Treated With Glutrin

First: GLUTRINIZED gravel roads are hard ALL THE YEAR ROUND.

Second: GLUTRINIZED roads SHED WATER—and for that reason they do not rut up during the winter and Spring.

Third: Glutrin is the best BINDER yet discovered for gravel stone, sand-clay, or slag or earth roads.

And finally: Glutrin is not only the BEST binder, but by far the most economical.

Glutrin has been manufactured by us in our own plants for over 15 years. We have our own tank car line in which to deliver the product. The material used in New Jersey was applied by Mr. M. R. Young, Trenton, N. J., with pressure distributors especially built to handle this product.

**Robeson Process Company**  
Fifth Avenue Building, 200 Fifth Avenue, New York



D. L. & W. R. R. Plaza, Morristown, N. J. Paved with Amiesite.

## Ride on *Amiesite*

the economical and durable bituminous pavement. **ECONOMICAL** because it is easily laid and maintained. **DURABLE** because of its resilient and wear-resisting qualities. Roads paved with Amiesite have withstood traffic for years without repairs.

Our plants have a capacity of one-half million yards of pavement annually.

Manufactured by the

**NORTH JERSEY AMIESITE COMPANY** MAIN OFFICE, 17 SOUTH ST., MORRISTOWN, N.J.

# The Highwayman of New Jersey



(Courtesy Portland Cement Association)

## When Vulcan Made 'em, They Lasted Forever

Vulcan was the blacksmith of the Gods on high Olympus.

The things he forged in his mighty smithy lasted forever.

Neither time nor tempest, age nor rust, could

destroy their everlastingness!

In that, they were similar to roads built of "Vulcanite"—the cement that is made in our giant plant at Warren Co., N. J., with its capacity of 2,000,000 barrels a year.

*"Let's get together and talk Cement!"*

**VULCANITE PORTLAND CEMENT CO.**

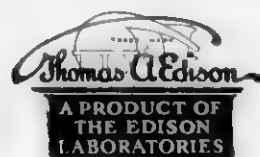
PHILADELPHIA

BOSTON

NEW YORK



Hamburg Avenue, Paterson, N. J.  
Built by Gus J. Dreher, Paterson, N. J., 1921-1922



**Edison Portland Cement**  
Used in the Construction of This Road

**EDISON PORTLAND CEMENT CO.**

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IN USE SINCE 1889

**Dragon**  
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**STRENGTH and UNIFORMITY**

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SERVICE

SERVICE

## When the Traffic Cop Says "Stop"—

you can stop—if you're on a Concrete street.

The firm, gritty surface of Concrete pavement gives maximum cooperation to brakes and tires. It is skid-proof even in wet weather.

Concrete is clean, permanent, hole-proof — everything the public and the motorist desire. And people can get the kind of pavement they want if they insist.

*Our Booklet R-4 tells other interesting things about Concrete Streets. Write for your copy.*

**PORTLAND CEMENT ASSOCIATION**

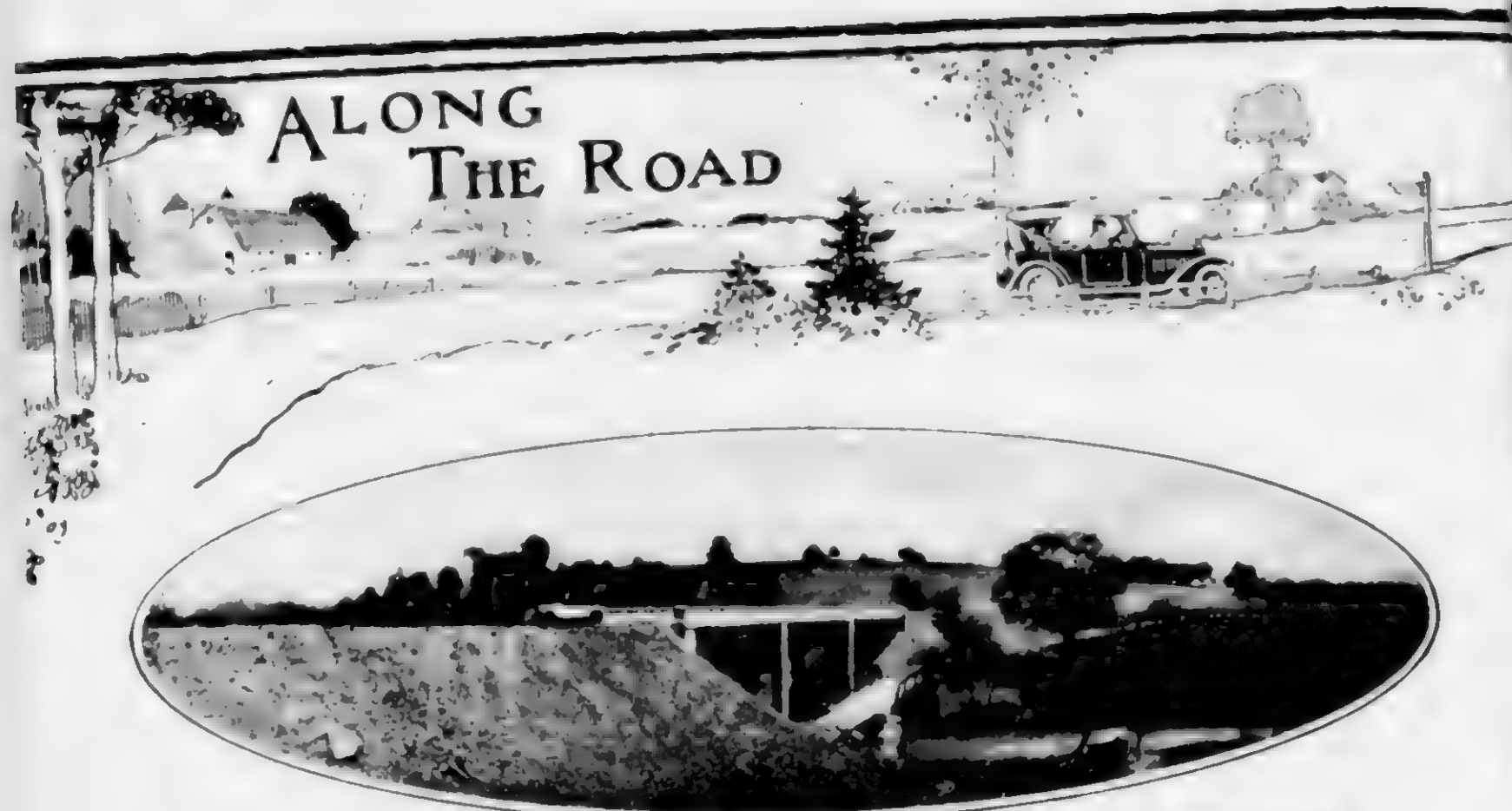
347 Madison Avenue, New York

*A National Organization to Improve and Extend the Uses of Concrete*

Offices in 23 Other Cities







The roads that handled the traffic of yesterday are now absolutely inadequate. Look at the photograph above and notice the new road and bridge and the old section of the road and bridge which it has replaced. This is one of many recent improvements along the Lincoln Highway.

#### Lest We Forget

While we are going ahead with our improved road programs, let us not forget the charm of the old roads—the "shady lanes" we traveled with horse and buggy, in the good old days.

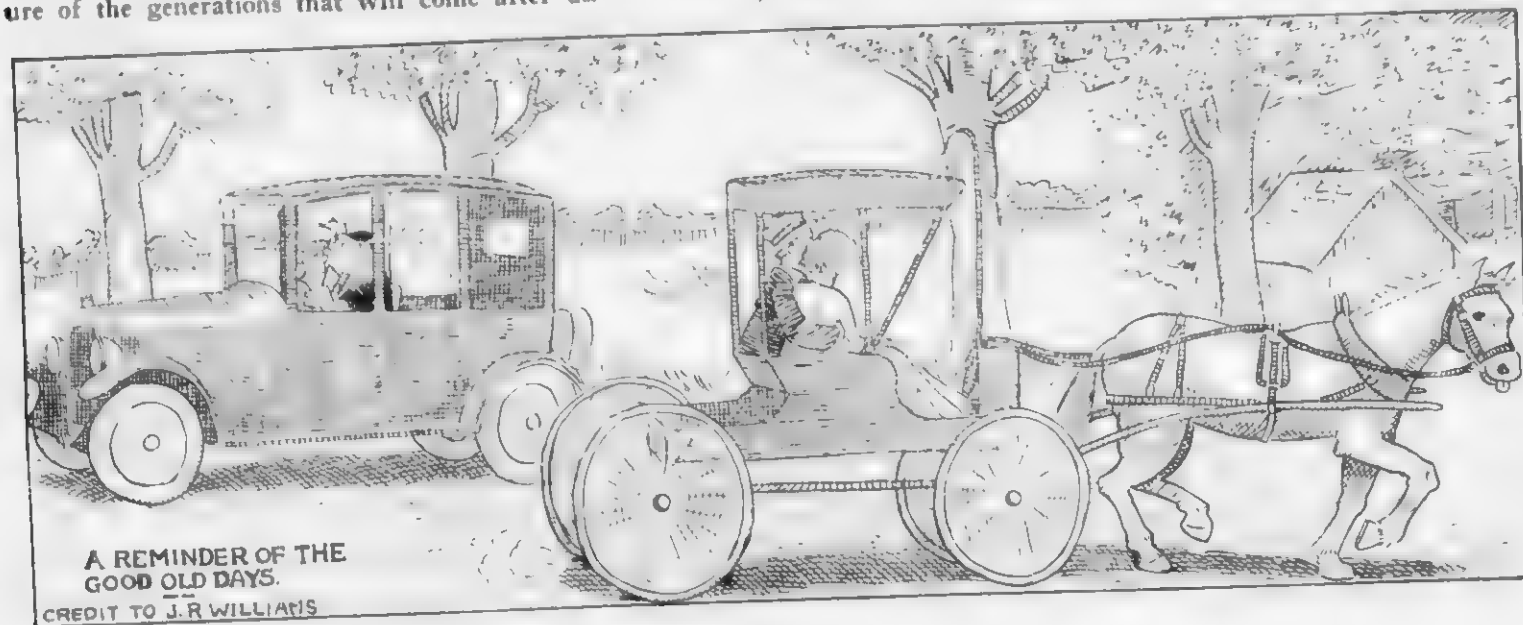
A hard surfaced road may be produced in a few weeks, but it takes years to produce shade. We should be thinking now about the planting of our new roads—and put that thought into action!

There are some pertinent thoughts in the following clipping, which has chanced to fall into our hands:

#### "Don't Forget Trees"

Building good roads is a new industry in this country. As far as it has gone, it has benefits that cannot be estimated. But in some respects the country has lost something by these improvements, something of the rural beauty has been sacrificed when so many trees have been cut down in making the new roads. The old-time country dirt-roads are prettier now, even though they are not as comfortable to ride over.

Right here we want to suggest to Blue Island property owners the great value of planting trees about their premises, wherever there is a convenient and suitable place for one, or wherever one is removed by the elements. Trees are not like flowers—it takes a tree years to become of sufficient size to afford shade and beauty, and each year finds fewer and fewer of them. So, regardless of what happens along our roads as they are being improved, let us plant more trees about our property, not only for our own comfort and pleasure, but for the comfort and pleasure of the generations that will come after us.



A western evangelist makes a practice of painting religious lines on rocks and fences along public highways. One ran: "What will you do when you die?" Came an advertising man and painted under it: "Use Delta Oil. Good for burns."

"Really," gasped the automobilist, bending over his victim, "really, I didn't hit you intentionally." "Aw, go on," returned the fallen one belligerently, "whatcher got that bumper on yer car for, if you don't expect to go runnin' into people?"

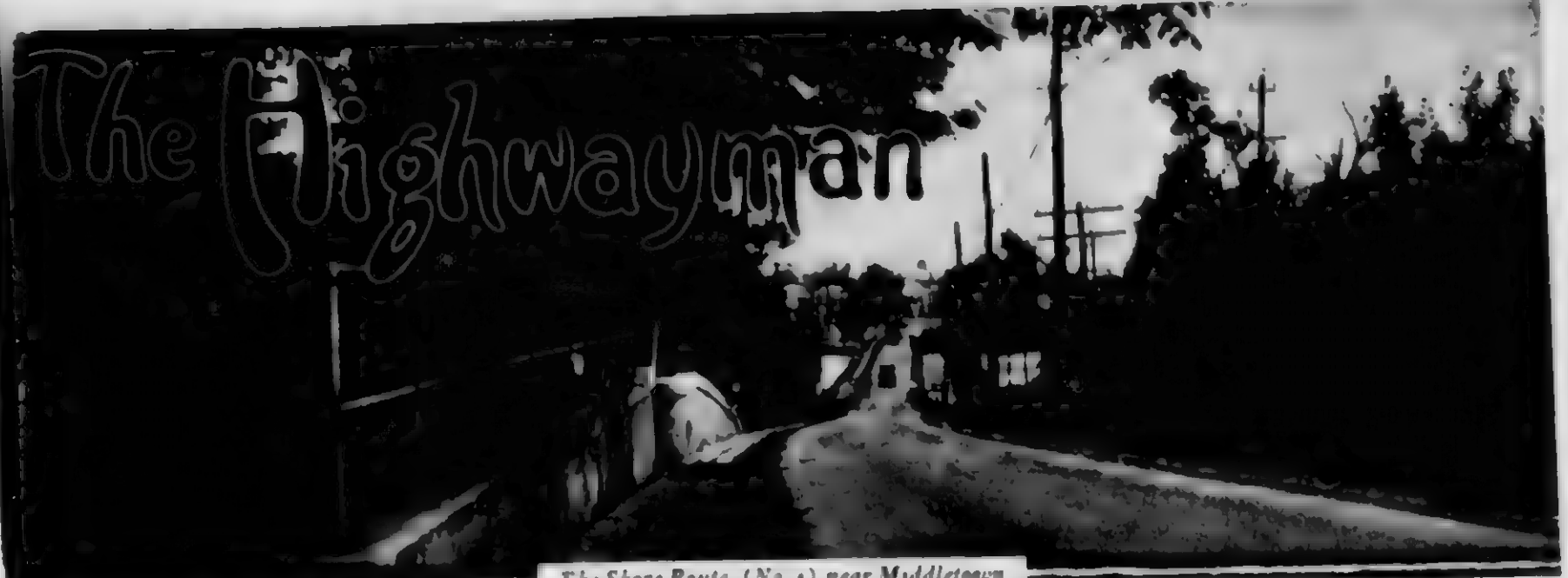
#### Beats the "Daily Dozen"

Doctor: Now that you have a car you must not neglect your daily exercise.  
She: Oh, he won't. It's a second hand car.

When the butcher gets a new automobile delivery wagon, his customers all wonder nervously what he did with his old horse.

#### Some Operators Don't Need 'Em!

A Minneapolis subscriber visited one of the offices in that city and noticed the automatic dial in front of an operator. He was greatly interested and shouted to his friend across the room, "Hey, Bill, this girl has a speedometer on her board!"



The Shore Route, (No. 4) near Middletown

October  
1922

## Road Builders' Supplement

Vol. II  
No. 3



Macadam paving which has been maintained with Tarvie "B", at Lenox Ave  
nue, Westfield, N. J.

### Note

The papers presented at the last Convention of the New Jersey Highway Association, and the discussions following them, are such a valuable contribution to the progress of road-building that it has been decided to publish them in full with as many as possible of the charts and illustrations used. (It has not been possible to include all of these, however, so there are occasional references in the text, to photographs and charts which have not been reproduced).

Our aim is to publish one or two of the Convention papers, with the discussion thereon, each month. We suggest that these be carefully filed, so that the reader may keep the complete set, which will make a very valuable addition to his road-building library.

This month we are printing "Refined Tars in Maintenance and Construction," by Philip P. Sharples, Technical Adviser, The Barrett Company, and the discussion thereon at the convention; "Purposes and Practices of the Asphalt Association," by Joseph R. Draney, President of the Asphalt Association, New York City, and the discussion thereon at the convention; and Contract News.

Next month there will be published "The Advantages Secured by Sealing a Bituminous Concrete Pavement with a Hot Sand Mixture," by G. H. Perkins, M. E., and the discussion thereon at the convention; also "Proper Methods to Follow in the Control of Paving Mixtures," by H. S. Mattimore, Engineer of Tests, Pennsylvania State Highway Department, and the discussion thereon at the convention; and Contract News.

## Refined Tars in Maintenance and Construction

By Philip P. Sharples, Technical Advisor, The Barrett Company

The maintenance problem in the long run is the most important one for the road engineer. Just at present, however, the road engineers are busy owing to the new construction. New construction carries with it a certain prestige that are sadly lacking in maintenance work. It is much more fun to build a new road than to fix somebody's cast-off road and try to make it last. Traffic, oftentimes with a lack of adequate funds to deal with. Yet it is not conceivable that any road supervising body will construct or reconstruct fundamentally more than 5% of its mileage annual. This leaves the remaining 95% that must be taken care of annually, if the original investment is to be preserved. Stated in figures, the State Highway Department and the counties of New Jersey might build 150 miles of road, but they have some 2,850 miles to maintain.

The cost of maintaining modern highways under modern traffic conditions is an unknown quantity. An analysis of the figures of any of our State Highway Departments leads to no just conclusion. Figures may be twisted almost any way to prove any particular proposition. I venture to say, however, that in the long run, provided a road is not overloaded for its type, and provided that it is carrying the load of traffic for which it was designed, that the cost of upkeep through a period of say 20 years, will be somewhat proportional to the original cost of the road. I know this is diametrically opposed to the prevailing popular notion on this subject, but an analysis of figures covering roads on which the traffic conditions are manifest, leads to this conclusion. On the one hand, extremely high costs are assigned at present to the simpler forms of paving like macadam, and extremely low costs are assigned to some of the modern rigid types of paving. Unless sufficient time has elapsed to prove the length of life of the rigid type road, it would be unsafe to predict the maintenance cost. On the other hand, the costs on the macadam type are generally arrived at by adding in the cost of rebuilding, or reconstructing an old worn-out macadam to resist modern traffic.

In almost any community where macadam roads already exist, a little study will show that this type of road when properly looked after, is adequately carrying a large traffic at a low cost per ton mile. Their unsatisfactory condition in most cases is due to utter neglect and a thorough misunderstanding of the economic factors in the case. A little consideration will show that if it is possible to make a macadam road stand the traffic imposed upon it, that it pays handsomely to spend even as much as a thousand or fifteen hundred dollars a mile per year on it, rather than to replace it with a pavement that would cost forty or fifty thousand dollars per mile.

The rehabilitating and traffic-proofing of the macadam road is peculiarly the province for tar materials. Much study has been given to the production of materials suitable for patching work, for surface treating work and for use as a binder in cheaply constructed bituminous macadam tops that are suitable for strengthening old macadam roads.

The maintenance of macadam roads by surface treatments was originated with tar materials. Improvement in the refined tars and in the equipment used, has kept these materials at the front for this class of work. The tars have a penetrating power beyond all other bituminous materials used for this purpose and also have the peculiar quality of setting up, that seems to render them to a considerable extent immune from shoving and waving troubles incident to the use of other bituminous materials.

The use of surface treatments cannot produce a good road out of one that is worn out. They cannot give a smooth surface to a road that is in need of surface repair. Surface treatments can, however, preserve macadam roads which are strong enough to uphold the traffic that goes

upon them from the surface wear and tear of self-propelled vehicles. In other words, surface treatments should be applied to macadam roads for their protection before the roads have worn out. If the macadam has worn thin or has ground up internally, it must be rebuilt before the surface treatment will give satisfaction. As a rule, surface treatments in New Jersey on old macadam roads have not given as good results as surface treatments in New England. The reason must be assigned to the almost universal practice of using clay as a binder for macadam roads in New Jersey, a practice that was never carried out in New England. New Jersey with the finest trap rocks in the world for building macadam should have the very best results with surface treatments if the roads are built properly to receive them. The macadam road with a surface treatment is still the most economical type to build for many types of traffic. It cannot be excelled in first cost or in low cost of maintenance where there is a preponderance of light weight traffic.

Two types of tar materials have been developed for surface treatment; a material which must be heated before application, and a material which is thin enough to apply cold. Under general conditions, the material which is to be applied cold gives the lowest yearly maintenance cost and is to be preferred. For certain park and boulevard conditions, however, the hot surface treatment gives the lowest unit cost through a series of years. The local factors must be thoroughly studied to see whether it is more economical to pay less for a comparatively short-lived treatment or to pay more for a more lasting treatment. The material applied hot may sometimes be used advantageously with semi-resurfacing methods. Its greater binding power and longer lasting qualities make it particularly adapted for this purpose.

The cost of surface treatments varies with the condition of the surface, the amount of refined tar required and the type of work decided upon. Simple surface treatments of refined tar applied cold over roads already in good condition may be made very cheaply. However, if much repair work is to be done, or if the surface of the road must be worked over before the bituminous material is applied, the cost will mount rapidly. If the work required on the surface is extensive, it may be very much cheaper in the long run to scarify the surface, add new stone and practically build a new top by the penetration method. In this case, a heavier material, a road binder, is required.

It is quite astonishing how much can be done by the use of the modern repair roller fitted with a steam scarifier. Too little attention has been given, especially by municipal and town engineers, to the possibilities of this type of work using tar binders, and few are aware of the low cost coupled with extremely satisfactory results that can be obtained by these methods, especially where truck service supplying hot binders can be obtained.

In conversation lately, a city engineer stated that the penetration topping of old macadam roads has been entirely too successful in his town, since it had absolutely killed all petitions for higher class pavements. The people were so entirely satisfied with the work done that they had no desire to pay for any other kind of improvement, and his plan of extending high priced pavements had been sadly interfered with. The property owner was, however, getting pavement service at a minimum cost, and this is the true mark of good engineering.

The tar binders have proved themselves equally serviceable in the building of new macadam roads. Tar binder has peculiar advantages for use in penetration work; it is strongly adhesive to cold stone; it re-unites easily if the bond is broken during rolling; it is easily liquified by steam heat so that it may be applied effectively by spraying equipment; and it can be used success-



# The Highwayman of New Jersey



When constructing penetration Macadam pavement, the hot bitumen is applied by means of a pressure distributor, in the manner shown in above picture taken on the Budd Lake Job.

fully with a great variety of stone. It also can be used earlier in the season and later in the season than other bituminous materials since it is less affected in its application by cold and dampness.

The penetration method is looked upon by some as a very crude operation and therefore not worthy of much study. It is true that it is a form of construction easily mastered but that does not prevent penetration work being badly done in many instances. The cardinal principles to be observed are simple, but certain fundamentals must be carefully carried out to produce perfect pavements. Really good penetration work, constructed with rocks like the Jersey trap rocks, carry a surprisingly heavy traffic at a low cost of maintenance. Stretches of bituminous macadam on the most traveled Maine State Highways have shown the lowest annual maintenance cost for any type of pavement. The type has a certain resiliency to it which enables it to stand temporarily overloading without damage, better than more rigid types of pavement. Even when damaged, provided it was originally well built, it can be brought back into serviceable condition at a comparatively low cost. This is not true of other types of paving of equal resisting power.

Penetration macadam with tar binder has proved a very efficacious method for widening existing hard surface types of paving. It is also employed, as on the Lincoln Highway near Metuchen, for shoulder work on new pavements. The shoulders of hard surfaced pavements with definite edges are peculiarly hard to maintain. Wheels dropping off of the hard surface, quickly form dangerous ruts. A strip of bituminous macadam, however, resists the occasional wheel dropping off the surface, and may be maintained level with the pavement at comparatively slight expense.

Where traffic becomes more crowded, the bituminous shoulder in reality provides a practical widening of the pavement at small cost. The methods employed in penetration macadam construction are easily modified so that strips, even as narrow as 18 inches may be economically constructed. In Wayne County, Michigan, some 60 miles of this type of shoulder have been installed with satisfactory results.

Repair work of all kinds is at present being carried on successfully with tar materials. The older types of materials, the hot and cold surface treatments and the binder, are used in many kinds of repair work and in protecting other types of pavement than macadam. The cold surface treatment has been found very effective in protecting certain types of gravel. The gravel, however, must be made up of a considerable proportion of pebbles one inch or thereabouts, and must contain a minimum amount of clay, the limit of which is usually set at 15%. The nearer the gravel approaches a macadam pavement in construc-

tion, the more sure the surface treatment is to be successful. Extremely interesting work along these lines has been done in Maine and New Hampshire in protecting the State Trunk Lines from the summer automobile traffic, where the resistance of the gravel road has been increased from 200 or 300 automobiles a day to 2,000 or 3,000 automobiles a day. The methods have, however, not been found applicable to the gravel of Southern New Jersey.

Cold surface treatments have been developed to successfully take care of bituminous macadam, bituminous concrete and even wood block pavements.

The low cost of maintenance of surface treatments and of penetration macadam is dependent largely on well developed patrol or gang maintenance systems. Surface treatments are liable to give way to weak spots in the road below and unless these are early patched, serious damage may result to the road. The work of patrol and gang maintenance has been made much more effective by the development of cold patching material. A cut-back tar product has proved particularly effective. The tar material mixes easily with the stone, seasons out quickly, and produces a patching compound which sets up solidly in the patch with little or no tendency to develop waves. Since it may be used cold, barrels of the material may be stored and used at convenient places along the roads, ready at all times for instant use. The cold patching material and mineral aggregate may also be mixed beforehand at central points, stored for future use, and carted out as required upon the road. Central storage plants, using an ordinary small concrete mixer to mix the batches have proved particularly effective in town and city work. With this material available, there is no excuse for any city or town neglecting its repair work and letting the streets get into condition dangerous for traffic. Properly mixed and graded material may often be used in making temporary repairs on heavy duty pavements, until it is convenient to put in more permanent work. It has been used successfully on streets like Broad Street, Philadelphia, carrying the heaviest traffic of a large city. Some of these temporary patches, overlooked in the permanent repairs, have carried traffic for a year or more.

The best results can only be obtained by careful attention to detail. The mixes must be rightly proportioned, and the work carried out in an intelligent way. Many cities now have repair gangs trained in this kind of work which patrol the streets carefully in order to make quick repairs wherever necessary. This kind of work has been found to pay handsomely and the repair gang's expenses are saved many times over in the longer service given by the pavement, and the pavements instead of being spasmodically good and generally bad, are at all times kept in good condition.

## General Discussion of Mr. Sharples' Paper

Col. WHITFORTH: I am sure that we were very much interested in hearing those remarks on this interesting subject. Are there any questions?

I would like to say in this connection that in Sussex County about 10 years ago a piece of road was built by the penetration methods. The penetration material was put on by hand, and although it is generally considered highly desirable that the stone be dry and the weather warm, I am informed that during a portion of this work, snow fell while some of this material was being poured. The work was done about 10 or 12 years ago, and is that section running from Hamburg over the mountain to Stockholm in Sussex County. That road today is in excellent condition, subject to the traffic that comes over all kinds of highways, some very heavy and some light. There are other penetration roads that have not been down two years and they are beginning to show bad pot holes. It makes a difference how a penetration road is built.

If Mr. George is present he can say something of interest to those who are here. It was built by the Shanley Brothers Company under Mr. George.

I also want to call attention to a remark that was made, and that is about binding the stone material in macadam roads. I have built some macadam roads and have always maintained that the proper way to build a stone road was to use stone. While there are many persons who have built stone roads successfully by the use of a certain amount of clay material to bind, clay retains moisture, and in cold weather the moisture freezes and expands and the road goes to pieces. I heartily agree with the statements of the speakers that clay is a bad material in a stone road. If you want to make use of modern treatment, keep out the water.

MR. WALSON G. CLARK: I would like an opportunity of correcting a statement made by the last speaker, of treating macadam for about 2 or 3 cents a square yard. Unfortunately, I come from the northern section of the State, where we pay from 15 to 16 cents a gallon for use of tars, and the best I could do for the last two years was 7 or 8 cents a square yard for surface treating macadam. It maintains up to about 7 cents with Tarvia B. I agree heartily with the Chairman when he says that correct road construction is entirely an engineering problem. The State of New Jersey from Sussex to Cape May has practically every character of sub-soil. Roads that would stand up in northern New Jersey would be highly expensive in the southern part of New Jersey when cheaper construction might be possible. However, I think that to try to build a fine permanent bituminous concrete surface on an ordinary waterbound macadam road, under the present growth of motor traffic would be a serious mistake at the present time. It would be something like putting a slate roof on a hay stack. If you build an ordinary well-constructed water-bound macadam road and start heavy traffic over it, no matter how well-preserved the surface, the stone in the foundation, due to the vibration, is going to disintegrate. If you lay a 2 in. top on a water-bound foundation, you are going to reduce but slightly the vibration of the stone in your foundation and gradually the stone will disintegrate.

On the road from Edgewater Ferry to the Hill they

were obliged to make some cuts for sewer purposes less than three or four years ago. They took pains to measure the stone in the whole foundation. There was at least 1 in. of the old macadam that had gradually disintegrated during the time that the road was maintained under macadam base treatment. Of the 2 1/2 in. stone that was laid, when it was examined there was not a stone in that foundation that was larger than 3/4 in. and most of it was dust. You can realize what vibration there is when a truck passes by you while standing on a side-walk. If it was not for the vibration, the stone would not disintegrate. In Bergen County we laid, about five years ago, a large number of bituminous concrete pavements on waterbound macadam. These roads stood up beautifully for three or four years, but as is the case all over the State, good roads soon develop the population. Motor busses began to run and it was surprising how soon these roads went to pieces when constantly being pounded every fifteen or twenty minutes under heavy bus traffic. It is a serious mistake to put a bituminous concrete road down unless the foundation is bound with either bituminous penetration or is of concrete. In that connection, I would like to say that best results have been obtained in our section where we have to take economy into consideration and use penetration, by using tar penetration foundation, covering the top with either asphalt or Amiesite. You can get tars quite cheap in Northern New Jersey, and they penetrate, as the speaker says, much more readily than asphalt. On top of that, I have built a good many roads using Amiesite top, and in other cases using an asphaltic treatment. I recall one instance where I put down nearly a mile of road, using 6 in. tar penetration and treating with a Squeegee coat. The road was subjected to tremendous traffic, and is only now being repaired after seven years of service. It cost 65 cents a square yard.

MR. DRANEY: Which of those roads in Bergen County have gone to pieces laid by Mr. Clark five or six years ago?

MR. CLARK: I spoke of the road paralleling the Hackensack River, from Hackensack to Westwood.

MR. DRANEY: I think the major portion of that road is in very excellent shape.

MR. CLARK: Those roads were subjected to extra heavy truck traffic, and were laid on water-bound macadam and show a very general deterioration.

MR. DRANEY: I have in mind a piece of road from Hohokus to Allendale, laid on macadam eleven years ago, which is in very good shape now.

MR. CLARK: That has not one-half the traffic of the road I speak of.

MR. DRANEY: I would refer to 5th Avenue, New York?

MR. CLARK: That is nothing but light automobile traffic.

MR. DRANEY: I would call attention to an example of asphalt on macadam, and that is the Grand Boulevard, Detroit, Michigan, which circles the town. This was laid nine years ago and the repairs have been comparatively none. It has about as much traffic as any boulevard in the country, because the Packard, Dodge Bros., and innumerable other factories feed it with trucks all day long. Traffic census shows at least 10,000 to 15,000 a day.

# The Highwayman of New Jersey



Springfield Avenue at Summit, N. J., which was treated with Tarvia "X" in 1917, and has been maintained since with Tarvia "B"

## Purposes and Practices of the Asphalt Association

By Joseph R. Draney, President The Asphalt Association, New York City

Few, if any, industries are unorganized in this day of concerted industrial effort. Such organization is essential not merely to the industries concerned, but in a broader sense it promotes the general welfare of the nation.

The Asphalt Association was organized in 1919 to place the asphalt industry in the march of progress along with the many other industries which had already organized. Our primary purpose was to obtain by investigation and scientific research, information and data which might prove useful in developing the best methods for the use of asphalt, particularly in paving, and for making known the essential characteristics and qualities possessed by asphalt which render it desirable under given conditions.

Equipped with such basic information and data it was our purpose to disseminate very widely our findings, utilizing every available agency including brochures and circulars, lectures, moving pictures, educational matter in the public press and personal contact. We have scrupulously avoided any policy or practice even remotely concerned with the regulation of prices, the apportionment of territory, the control of output or in any way constituting a restriction upon the freest and most unhampered competition among asphalt producers. We have taken extreme care to avoid any violation of not only the letter and spirit of the laws of the land but also the ethics of business as well. Also I might add that our work is wholly on constructive lines.

It is a fundamental policy with The Asphalt Association to give out such correct information as will result in the adoption of the best possible methods in the use of asphalt, particularly for paving, and that the information be sufficiently comprehensive to cover every type of asphalt pavement and every method of using asphalt for other paving purposes. We conscientiously believe that asphalt is an enduring and exceedingly useful paving material and we believe that we can increase its popularity by making widely known its qualities and the correct methods for its use.

### A Clearing House for Information

Prior to the formation of the association there was little coordination of the various facts and theories concerning asphalt. There were many and conflicting specifications. Workable instructions covering the uses of asphalt were scattered in many publications and much of the data was locked up in the minds of men who had the

knowledge but had not made it public in printed form. There was no recognized clearing house for knowledge or fountain-head of authority on questions relating to asphalt paving. The association has provided such a clearing house and fountain head.

We have, through our Technical Committee, at the head of which is Mr. Prevost Hubbard, formerly Chief of the Division of Research at the U. S. Bureau of Public Roads, prepared and issued specifications covering every type of asphalt pavement. These specifications are now regarded as authoritative. We have issued a comprehensive series of brochures and circulars giving simply and clearly essential information as to paving methods. These publications are products of the best minds in the industry, as we have, in addition to the regular staff of the association, all of the technical knowledge possessed by the engineers and chemists of the various member companies. We are justified, therefore, in saying that the information we give out may be regarded as sound and workable. The management of the association and the many economic questions involved in the work are handled by the Secretary, Mr. J. E. Pennybacker, who was formerly Chief Highway Economist for the Federal Bureau of Roads.

Leading colleges and universities, including such representative institutions as Yale University, the Massachusetts Institute of Technology, the University of Michigan and the Georgia School of Technology, now include in their courses of engineering construction, illustrated lectures on asphalt paving delivered by representatives of The Asphalt Association. We believe that a thorough knowledge of asphalt and its uses in paving should be possessed by the engineer graduate and we are successfully bringing this about with a resultant benefit both to the taxpayers and the industry.

In our research work we are cooperating with the U. S. Bureau of Public Roads and various municipal engineering organizations. Just now we have studies under way in which we are cooperating with the Federal Bureau and the city engineers of New York, Philadelphia, Baltimore, Washington and Detroit. We have conducted investigations and tests on our own account concerning the resistance of asphalt to impact and have developed some highly important facts which should influence paving design. Our cooperation with the government has also resulted in the production of some excellent moving pictures showing the construction of various types of asphalt pavements. This

association has obtained reductions in freight rates on asphalt in the belief that this would benefit the taxpayers and stimulate road building and we have consistently opposed tariff duties on imported crude oil as we felt that this would add to the burden of the consumer. In short, we have endeavored to square the interests of the industry with those of the public and to make the association an organization of widespread general usefulness.

We are not content to stand still or to take it for granted that we have a complete grasp of asphalt paving problems. While we have the benefit of the services of much of the best talent, we are glad at all times to receive suggestions from those who are considerate and generous enough to give them to us. At the same time we invite every engineer, highway official and contractor to call upon the association for information and advice about any question relating to the use of asphalt. We are always willing and ready to cooperate with those engaged in the use of asphalt with the idea of reaching as nearly a maximum of efficiency as is possible.

Reports state that the highway departments of Illinois, Iowa, Kansas, Michigan, Minnesota, Missouri, South Dakota and Wisconsin are all now in a hurry to buy asphalt. The reason for this is that they are all in a hurry to build roads. The reason for this is that they are all in a hurry to build roads. The reason for this is that they are all in a hurry to build roads.

Asphalt is a material which withstands the enormous traffic of our principal cities as well as many of the best state highways and which is practically no more costly than unsurfaced Portland cement concrete, is not good enough for our country highways. Asphalt is marketed upon a keenly competitive basis which is maintained by the very sharp differences in price between the various producers at the different oil fields. The contract for asphalt is more properly a contract for the use of asphalt in the construction of public works.

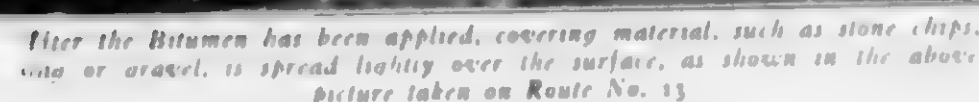
### The Asphalt Association

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Mr. HUBBARD: I do not think anyone will attempt to gainsay that concrete makes an excellent base under the surface. The record of Portland cement concrete as a base for bituminous pavements proves the contrary if such an assertion is made. I do not think that is the point, exactly. The point is that other materials may be success-

**COL. WHITFORD:** Any more questions, gentlemen? I would like to emphasize most clearly that road construction is an engineering problem and no matter what material is used, you can get a good road for certain kinds of traffic if approached from an engineering standpoint, whether by getting rid of water by providing for drainage or by handling a certain kind of material a certain way. You can't get a good road by any hard and fast rules, so that any amateur can dig it out of a book and go to any certain section of the country, say California, and say this is a good road in New York. Out of my experience I feel at liberty to state that road building is an engineering problem and must be handled by men with an engineering turn of mind to see what the conditions are, and then design and build roads in accordance with those conditions. It is a dangerous thing to make up specifications with the use of a maulage pot and a pair of shears.

In many cases, the high cost of maintenance is due to the fact that the roads are entirely unsuited for the traffic and they are compelled to bear due to shallow foundations and poor sub-grade. If these roads instead of simply being resurfaced with stone were rebuilt with deeper and more adequate foundations and give a proper macadam surface and then maintained with bituminous materials, in probably 90% of our traffic conditions such a road would give a surface that is pleasant to drive over, non-skidding in wet weather and one that readily frees itself from snow and sleet in winter months. This latter point is interesting in that I have recently watched a bituminous surfaced road and a concrete road during the recent snow fall. Two days after the snow ceased the bituminous road with a dark top was clear of snow and dry, while the concrete surface was still entirely covered with snow.

In connection with the use of cutback tar materials for maintenance patching, I feel that the use of central mixing plants where machine mixing may be employed, would



result in more efficient and economical work, as the mixtures made in this manner could be made more uniform in their bitumen content.

Mr. Sharples has spoken of the use of cut materials for use in emergency repairs, on city streets. I might relate an experience we had in a large city in western New York where the gas company secured permission to make temporary repairs of their street openings during the winter months. They used quite a large amount of cutback tar for several years, when suddenly permission to make these patches was recalled. Investigation showed that the reason was due to the fact that the asphalt company that had the contract to make these repairs was only able to find about one-half the patches in the spring, and they objected to the loss of this business.

It is probable that considerable economies might be effected in connection with the equipment used for patrol and maintenance work. One thought is the suggestion to

use creosoted material for building the platforms for stone and cradles for holding the drums. Such creosoted material would have a very much longer life and would permit the use of better grades of lumber. There are a number of small details that are well worthy of a better thought such as the proper weight and shape of the tamper. Some makes of picks keep their edge very much longer than others. A rustless wire broom would be a great aid. A little care in specifying the material used in filling both the large and small brooms would greatly increase their life.

In concluding, I wish to state that in my opinion maintenance work is one of the most important propositions and has not been given the prominent place it deserves, probably because it is hard work and mighty little glory, but there is no branch of road work where a little intelligence mixed with the stone and the binder will return a greater profit.

## Contract News

Prepared to October 6th, 1921

Jan. 11—Route No. 6, Section 8, Pearl St., Bridgeton, Reinforced Concrete paving job, 0.433 miles, 20 and 30 feet wide with gravel shoulders was awarded to the Tri-State Construction Company, Bridgeton, N. J., on their low bid of \$76,302.16.

Feb. 8—Route 6, Section 5, Shirley-Oldman's Creek, Reinforced Concrete Paving job, 6.812 miles, 20 feet wide with gravel shoulders, was awarded to the Benjamin Foster Company, Philadelphia, Pennsylvania, on their low bid of \$254,021.51.

Feb. 16—Route 6, Section 6, Oldman's Creek-Mullica Hill, Reinforced Concrete Paving job, 5.028 miles, 20-30 feet wide with gravel shoulders, was awarded to the firm of M. Staub, Swedesboro, New Jersey, on his low bid of \$203,660.48.

Feb. 24—Route 14, Section 5, Cape May Court House to Swanton, Reinforced Concrete paving job, 2.987 miles, 20 feet wide with gravel shoulders, was awarded to the firm of Sutton and Corson, Ocean City, New Jersey, on their low bid of \$118,776.16.

Mar. 8—Route 6, Section 10, Quinton to Marlboro, Grading and Graveling job, 5.994 miles, 20 feet wide, with earth shoulders, was awarded to the Masterson Construction Corporation, New York City, on their low bid of \$79,793.17.

Mar. 8—Route 6, Section 11, Salem to Quinton, Reinforced Concrete paving job, 2.648 miles, 20 feet wide with gravel shoulders was awarded to Joseph F. Burke, of Plainfield, New Jersey, on his low bid of \$111,833.79.

Mar. 8—Route 4, Section 9, Smithville-Mullica River, Warrenite Bitulithic job, on concrete base, 3.748 miles, thirty feet wide, with gravel shoulders was awarded to C. H. Earle of Hackensack, New Jersey, on his low bid of \$374,533.77.

Mar. 8—Route 10, Section 1-B, Arcadian Way to Anderson Ave. in Fort Lee, Reinforced concrete paving job, 0.48 miles, 20 and 30 feet wide with earth shoulders, was awarded to the firm of John J. McGarry, Edgewater, New Jersey, on his low bid of \$104,362.61.

Mar. 15—Route 11, Section 1, Main Street, Passaic, Sheet Asphalt job, on Concrete Base, 0.257 miles, 22 feet, 2 inches wide, was awarded to Union Building Construction Company, Passaic, New Jersey, on their low bid of \$15,160.15.

Mar. 23—Route 4, Section 6, Eatontown-West Long Branch, Sheet Asphalt job on Concrete Base, 2.69 miles, 20 feet wide with earth shoulders was awarded to the Utility Construction Company of New Brunswick, New Jersey, on their low bid of \$149,679.74.

Apr. 4—Route 2, Section 3, South Broad Street Storm Drain job was awarded to A. G. Thompson, of Trenton, New Jersey, on his low bid of \$17,665.06.

Apr. 4—Route 2, Section 3, South Broad Street, Sheet Asphalt job, on Concrete Base, 0.648 miles, 48.5 feet wide, was awarded to J. J. Barrett, Trenton, New Jersey, on his low bid of \$69,433.77.

Apr. 12—Route 6, Section 9, Salem-Collier's Run, Reinforced Concrete Paving job, 4.752 miles, 20 feet wide with gravel shoulders was awarded to Sampson & Reuter, Elizabeth, New Jersey, on their low bid of \$196,975.08.

Apr. 15—Route 3, Section 8, Camden-Clements Bridge Road, Reinforced Concrete Paving job, 3.82 miles, 36 and 40 feet wide with earth shoulders was awarded to W. Penn Corson, Camden, N. J., on his low bid of \$269,644.85.

Apr. 15—Route 3, Section 9, Clements Bridge Road to Kirkwood, Reinforced Concrete Paving job, 3.756 miles, 29 feet wide with earth shoulders was awarded to John M. Kelley Construction Co., Camden, N. J., on their low bid of \$200,592.95.

Apr. 15—Route 3, Section 10, Kirkwood-Berlin, Reinforced Concrete Paving job, 5.576 miles, 29 feet wide with earth shoulders was awarded to John M. Kelley Construction Co., Camden, N. J., on their low bid of \$297,993.89.

Apr. 18—Route 15, Sections 2 and 3, Bridgeton-Mill-

ville, Warrenite Bitulithic on Concrete base, 8 miles, 20 feet wide with gravel shoulders was awarded to the Tri-State Construction Company of Bridgeton, New Jersey, on their low bid of \$455,500.12.

Apr. 18—Route 4, Section 14, Laurelton-Lakewood 3.875 miles, Reinforced Concrete Paving job, 20 feet wide with gravel shoulders was awarded to C. H. Earle of Hackensack, New Jersey, on his low bid of \$144,705.68.

Apr. 19—Route 4, Section 10, Shadow Lawn-Roseld Avenue, Sheet Asphalt Paving job on Concrete Base, 2.41 miles, 20 and 36 feet wide with earth shoulders, was awarded to Newark Paving Company, of Newark, New Jersey, on their low bid of \$104,969.51.

Apr. 19—Route 4, Section 12, Sea Girt Avenue, Reinforced Concrete Paving job, 0.162 miles, 20 feet wide with earth shoulders was awarded to T. H. Riddle, New Brunswick, New Jersey, on his low bid of \$8,569.23.

Apr. 21—Route 9, Section 6, Somerville-Bound Brook, Reinforced Concrete Paving job, 2.491 miles, 20 feet wide, earth shoulders was awarded to Salmon Brothers, Netcong, New Jersey, on their low bid of \$131,710.10.

Apr. 24—Route No. 4, Section 5-A, Storm Drain in Red Bank, was awarded to Chas. J. Romano, Montclair, New Jersey, on his low bid of \$15,314.85.

Apr. 25—Route 5, Section 5, Madison Avenue, Madison Township and Borough of Madison, Warrenite Bitulithic on Concrete base, 2.032 miles, 20 feet wide with earth shoulders, was awarded to the Northern Construction Company, of Newark, New Jersey, on their low bid of \$117,844.37.

Apr. 28—Route 4, Section 13, Richmond Ave., Point Pleasant Beach, Reinforced Concrete paving job, 0.848 miles, 20 feet wide with earth shoulders was awarded to C. H. Earle of Hackensack, New Jersey, on his low bid of \$35,471.76.

May 9—Route 9, Section 5, Union Avenue, Bound Brook, Sheet Asphalt on Concrete Base, 1.501 miles, 20 feet wide with earth shoulders was awarded to the Utility Construction Company of New Brunswick, New Jersey, on their low bid of \$93,090.31.

May 26—Route 4, Section 15, Lakewood (County Section) 2.556 miles Reinforced Concrete Paving job, twenty-eight and thirty feet wide, was awarded to the Public Service Production Company of Newark, New Jersey, on their low bid of \$75,748.82.

May 26—Route 4, Section 15, Lakewood (Township Section) 2.556 miles, Reinforced concrete paving job, 36 and 50 feet wide was awarded to C. H. Earle of Hackensack, New Jersey, on his low bid of \$105,741.10.

May 26—Route 9, Section 8, North Branch-Somerville, 3.837 miles, Reinforced Concrete paving job, 20 feet wide with earth shoulders was awarded to Ralph Sangiovanni, on his low bid of \$159,077.59.

May 26—Route 16, Section 3, Bedminster-Plukamin, 2.415 miles Reinforced Concrete paving job, 20 feet wide with earth shoulders was awarded to Ralph Sangiovanni, on his low bid of \$135,648.39.

May 26—Route 4, Section 16, Maine St., Toms River, 1.096 miles long, Reinforced Concrete paving job, 20, 30, 36, 38 and 56 feet wide with gravel shoulders was awarded to the Public Service Production Company of Newark, New Jersey, on their low bid of \$62,864.59.

June 8—Route 5, Section 9, Barker's Corner-Hacketts-town, 2.99 miles Reinforced Concrete paving job, 20 and 48 feet wide with earth shoulders was awarded to Frank I. Groman, of Bethlehem, Pennsylvania, on his low bid of \$230,274.37.

June 8—Route 9, Section B, West Front Street, Plainfield, Sheet Asphalt paving job on Concrete Base, 1.929 miles, 40 and 41 feet wide, was awarded to the Union Paving Company, of Newark, New Jersey, on their low bid of \$219,316.20.

June 10—Route 6, Section 12, East Commerce Street, Bridgeton, 1.314 miles long. Sheet Asphalt paving job on

Concrete Base, 20 and 32 feet wide, was awarded to E. K. Mixner Co., on their low bid of \$80,422.01.

June 20—Route 2, Section 3-A, Whitehorse-Crosswicks Creek, 0.389 miles, Reinforced Concrete paving job, 30 and 40 feet wide was awarded to Daniel Klockner, of Trenton, New Jersey, on his low bid of \$37,472.82.

June 21—Route 5, Section 6, Speedwell Avenue, Morris town, Warrenite Bitulithic surface on Concrete Base, 1.426 miles, 23 feet, 3½ inches wide was awarded to J. S. Geiger Sons of Newark, New Jersey, on their low bid of \$144,892.74.

June 21—Route 9, Section 9, Phillipsburg-Still Valley, Reinforced Concrete paving job, 1.68 miles, 20 and 36 feet wide with earth shoulders was awarded to Crilly and Cannon of Phillipsburg, New Jersey, on their low bid of \$110,345.40.

June 28—Route 1, Section 6, Trenton City Line-Nottingham Way, reinforced concrete paving job, 0.928 miles, 39 feet, six inches wide, was awarded to Rees and Taylor, of Trenton, New Jersey, on their low bid of \$95,347.47.

June 28—Route 4, Section 11, Main Street, Avon, New Jersey, Warrenite Bitulithic surface on Concrete Base, 0.663 miles, 43 feet wide with earth shoulders was awarded to the East Jersey Bridge Company, of Perth Amboy, New Jersey, on their low bid of \$54,814.34.

July 7—Route 4, Section 17, Barnegat, Reinforced Concrete job, 1.0 miles, 20 feet wide with gravel shoulders, was awarded to the Public Service Production Company of Newark, New Jersey, on their low bid of \$43,931.94.

July 7—Route 4, Section 18, Tuckerton, Reinforced Concrete job, 1.5 miles, 20 feet wide with gravel shoulders, was awarded to the Public Service Production Company of Newark, New Jersey, on their low bid of \$59,913.83.

July 13—Route 9, Section 7, Main Street, Somerville, Reinforced Concrete job, 0.197 miles, was awarded to J. L. Bachman of Linden, N. J., on his low bid of \$74,180.25.

July 14—Route 16, Section 2, Mine Mount Road-Bedminster Corner, Reinforced Concrete job, 2.515 miles, was awarded to the Engineering Construction Corporation, Philadelphia, Pennsylvania, on their low bid of \$166,802.65.

July 17—Route 9, Section 9-A, Still Valley-Bloomshury, Reinforced Concrete job, 2.92 miles, was awarded to Bernard E. Tighe Construction Company of Easton, Pennsylvania, on their low bid of \$127,785.84.

July 21—Route 5, Section 8, Great Meadows-Barker's Corner, Reinforced Concrete, was awarded to Salmon Bros., Netcong, New Jersey, on their low bid of \$186,688.69.

July 25—Route 1, Section 13, Highland Park-Stelton Road, Warrenite Bitulithic on Concrete Base, was awarded to S. S. Thompson & Company, Incorporated, Red Bank, New Jersey, on their low bid of \$305,394.61.

July 25—Route 1, Section 14, Stelton Road-Metuchen, Warrenite Bitulithic on a Concrete Base, was awarded to S. S. Thompson & Company, Incorporated, Red Bank, New Jersey, on their low bid of \$344,784.65.

Aug. 9—Route 15, Section 4, Millville, Warrenite Bitulithic Surface on Concrete Base, 0.986 miles, 20 feet wide, was awarded to the Tri-State Construction Company, of Bridgeton, N. J., on their low bid of \$55,796.67.

Aug. 10—Route 6, Section 14, Woodbury, Reinforced Concrete paving job, 1.505 miles, 20 feet wide and 46 feet wide, was awarded to the Public Service Production Company of Newark, N. J., on their low bid of \$169,775.88.

Aug. 18—Route 10, Section 3, Little Ferry-Ridgefield, Reinforced Concrete job, 1.76 miles, 20 to 30 feet wide, was awarded to John I. McGarry, of Edgewater, N. J., on his low bid of \$146,760.88.

Aug. 18—Route 10, Section 5, Hudson Street, Hackensack, Sheet Asphalt job, 1.449 miles, 20 ft. 4 in. and 42 ft. 6 in. wide, was awarded to G. M. Brewster, Tenafly, N. J., on his low bid of \$140,205.49.

Aug. 18—Route 10, Section 5-A, Essex Street, Hackensack, Reinforced Concrete Paving job, 0.346 miles, 22 feet wide, was awarded to Ufheil and Phelan, Hackensack, N. J., on their low bid of \$24,323.09.

Sept. 15—Route No. 7, Section 1, Corlies Ave., Neptune Township, Warrenite Bitulithic on Concrete Base, 0.949 miles, 33 feet and 38 feet wide, was awarded to the East Jersey Bridge Company, of Perth Amboy, New Jersey, on their low bid of \$97,110.68.

Sept. 15—Route No. 4, Section 5-A, Maple Ave., Red Bank, Sheet Asphalt Paving job on Concrete Base, 1.308 miles, 40 feet wide was awarded to the Wm. P. McDonald Construction Company, of New York City, on their low bid of \$109,560.95.

Sept. 15—Route No. 9, Section 7-A, Union Ave., Grove St., Somerville, Reinforced Concrete Paving job, 0.778 miles, 20 feet wide, was awarded to the N. J. Construction Company, of Hackensack, N. J., on their low bid of \$77,549.47.

Sept. 15—Route No. 16, Section 4, Pluckamin-Somerville, Reinforced Concrete Paving job, 5.475 miles, 20 and 30 feet wide, was awarded to the Peconco Engineering & Construction Company, of New York City, on their low bid of \$329,749.09.

Sept. 15—Route No. 1 and 13, connecting link through New Brunswick, Asphalt Block Pavement on Concrete base, 0.874 miles, 37.4 and 45 ft. wide, was awarded to the Utility Construction Company, of New Brunswick, on their low bid of \$122,644.48.

Sept. 28—Route No. 14, Section 7, Petersburg-Greenfield, Grading and Graveling job, 1.99 miles, 20 feet wide with earth shoulders was awarded to Ross & Whelan of Trenton, N. J., on their low bid of \$85,196.86.



# The Highwayman



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# The Highwayman



Hammonton Lake, Route 3

November  
1922

Road Builders' Supplement

Vol. II  
No. 4



In front of Seaview Golf Club, near Atlantic City, (Route 4)

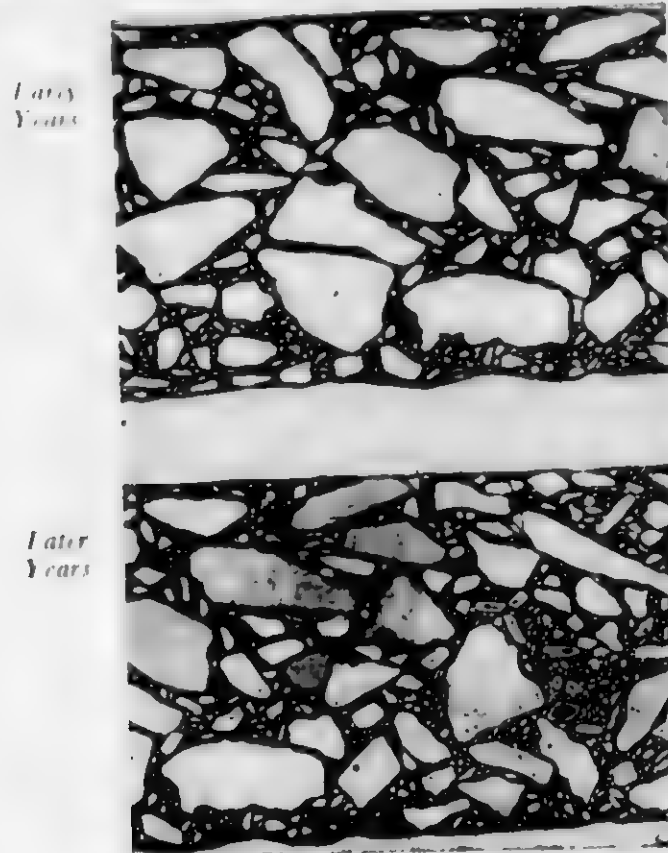
## Note

The papers presented at the last Convention of the New Jersey Highway Association, and the discussions following them, are such a valuable contribution to the progress of road-building that it has been decided to publish them in full with as many as possible of the charts and illustrations used. (It has not been possible to include all of these, however, so there are occasional references in the text, to photographs and charts which have not been reproduced).

Our aim is to publish one or two of the Convention papers, with the discussion thereon, each month. We suggest that these be carefully filed, so that the reader may keep the complete set, which will make a very valuable addition to his road-building library.

This month we are printing "The Advantages Secured by Sealing a Bituminous Concrete Pavement with a Hot Sand Mixture", by G. H. Perkins, M. E., Warren Bros. Co., and the discussion thereon at the convention; also "Proper Methods to Follow in the Control of Paving Mixtures", by H. S. Mattimore, Engineer of Tests, Pennsylvania State Highway Department, and the discussion thereon at the convention; and Contract News.

Next month there will be published, "Proper Use of Highway Literature", by Charles E. Murphy, Texas Company; "Care and Handling of Highway Equipment", by A. M. Cawley, Lakewood Engineering Co., and the discussion thereon at the convention; "The Use of Explosives in Road Building", by N. S. Greensfelder, Hercules Powder Co., and Contract News.



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Max. of Mortar

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## The Advantages Secured by Sealing a Bituminous Concrete Pavement with a Hot Sand Mixture

By G. H. Perkins, M. E.

The title of the subject which has been assigned to me, viz.: "The Advantages Secured by Sealing a Bituminous Concrete Pavement with a Hot Sand Mixture," brings up at once four pertinent questions—

- 1st. Is it necessary to seal the surface of a properly designed bituminous concrete?
- 2nd. Can it be sealed with "a hot sand mixture"?
- 3rd. If it is necessary and possible, how can this be done?
- 4th. In what respects is the final product an improvement over prior construction?

On account of our long familiarity with bituminous concrete such as Bitulithic and with the dense asphaltic concrete binder and sand mixtures used in sheet asphalt construction, these questions appear extremely simple; however, in evolving our answers, we must be careful to think clearly or we shall be led astray by the similarity in appearance of products which are actually radically different in both structure and physical characteristics.

In reply to our first question as to whether a properly designed and constructed bituminous concrete needs to have its surface sealed, let us review the history of the Bitulithic pavement which was not only the best known bituminous concrete, but also the one which received the most study.

### F. J. Warren Invention

When F. J. Warren invented this pavement he found that by properly proportioning the amounts used of the various sizes of aggregate from coarse to fine, he produced an aggregate which contained a very low percentage of voids, possessed "inherent stability" and required much less bituminous cement than was necessary in sand mixtures.

The increased stability of the aggregate was caused by two factors, first the interlocking of the coarser with the smaller particles, second the greater inertia of the large particles of stone or gravel used, it being manifest that greater force is required to move a 1 in. stone than a grain of sand.

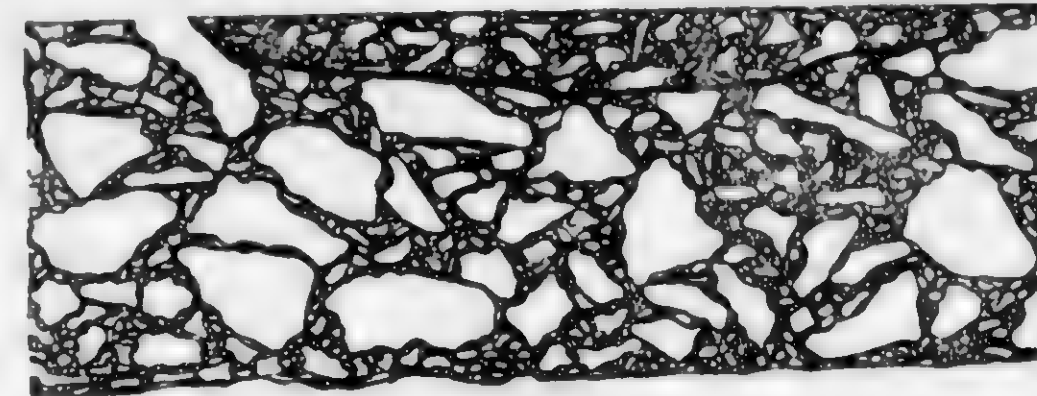
The stability of the pavement as a whole was also governed by two factors, viz., the inherent stability of the aggregate and the proportion of bituminous cement used in the mixture, because, while the particles of stone, gravel, or sand are unaffected by any change in temperature to which the pavement is subjected, and these particles are individually as rigid in hot as in cold weather, the bituminous cement is very susceptible to temperature changes, and in hot weather becomes plastic, consequently as the physical characteristics of the completed pavement must be a composite of the characteristics of its component parts, it was obvious that the stability of the pavement would be increased by keeping the percentage of the mortar element composed of fine aggregate and bituminous cement down to the minimum amount required to fill the spaces between the larger stones.

The early Bitulithic pavements were designed upon this basis.

### Necessity of Flushcoat

When these mixtures were spread and compressed it was found that the surface contained small pores in the mortar between the uppermost stones and that it was necessary to seal these pores with liquid bitumen known as "flushcoat," then in order to prevent the flushcoat bitumen from adhering to wheels of vehicles it was necessary to roll stone chips or coarse sand into this thin film of bitumen. It was, of course, appreciated that these stone chips or hard particles of coarse sand when rolled, actually perforated the film of bitumen, changing it from one continuous waterproof sheet to literally a fine mesh sieve, with a stone chip placed in each hole of the sieve; however, at that time, it was believed that the freedom from voids and the stability of the aggregate were all that were needed and the advocates of the pavement adopted the slogan—"THE STONE TAKES THE WEAR."

No more truthful—no more unfortunate slogan—could have been adopted, because the bituminous mat formed by the flushcoat bitumen and chips was very short lived, soon



SKIM PATCH  
Bonded to but not Blended with Old Pavement  
(Cut 1/4 Size)

wore off, and when this happened, the exposed surfaces of most of the uppermost stones were seen to be fractured, allowing water to enter and start disintegration.

### Early Design

The diagram is intended to show the basic design of these early pavements in which it will be seen that there is a minimum of fine mortar and a maximum amount of interlocking of the medium and largest sized stones. These pavements were so excessively rigid that the stones exposed at the surface of the pavement were soon more or less shattered by traffic; those which were completely shattered would be displaced, thus removing lateral support from adjacent stones, causing these to "ravel out" and form holes.

When a graded loose upon the foundation, the upper surface of the loose layer contains an excess of coarse stones, there being little or no fine mortar visible. As the roller compacts the layer it pushes the stones down and these squeeze the mortar toward the surface. It was therefore suggested that if the mixture contained more fine aggregate mortar than that needed to just fill the spaces between the stones in the body of the pavement the excess would be brought to the surface by the roller and thus form a seal and protect the coarsest stones from the shattering effect of traffic.

This idea was put in practice at once and did to a very large extent reduce the amount of raveling, but on the other hand introduced a new and equally serious difficulty.

### Modified Design

Up to this point the proportioning of the aggregate could be determined by laboratory tests for voids, but as the amount of this excess mortar which would be brought to the surface by the roller depended upon so many factors such as the condition of the weather, temperature of the mixtures, etc., it was impossible to forecast how much of this excess would be brought to the surface by the roller and traffic and how much excess would remain down in the body of the pavement and thus spread the stones apart, as shown in the lower photo of this diagram (page 2). While this excess in the lower portion did of course act as a cushion for the stones and thus reduce the crushing effect of traffic, it seriously reduced the extent of interlocking of the particles and the stability of the pavement. It thus became an engineering problem to determine from a study of the road and its traffic conditions just how much excess mortar should be used in each case.

It was also obvious that while this compromise method produced more durable pavements, it could not be expected to produce a seal or protective covering for the uppermost stones, because when the mortar rose between the uppermost stones to the level of their tops, then the roller wheel would be supported partly by the stones, partly by the mortar, and both being subjected to the same pressure, the mortar would cease to rise, therefore it was still necessary to flushcoat the pavement, and as soon as the flushcoat was worn off by traffic, the upper surfaces of bitumen was exposed to the elements and the abrasion of traffic as before.

Where such pavements were exposed to excessive moisture, re-flushcoating had to be resorted to at periodical intervals to prevent disintegration, the frequency of such

treatment being dependent on the character of the stone used and traffic conditions.

In maintaining these streets and roads, Mr. E. C. Wallace who was in charge of bituminous mixtures for our company found that a ravelled spot or a depression could be repaired by painting the surface of the old pavement with a liquified asphaltic paint and then applying a layer of Bitulithic mixture containing an aggregate appropriate for the thickness of the so-called "skim patch."

In many cases these patches failed to adhere and peeled off in cold, wet, spring weather; others would shove into knots and waves; but many held in place, and wherever this occurred he noticed that such fine aggregate patches were more durable and more impervious to water than the surrounding coarse bituminous concrete surface.

### Invention of Warrenite-Bitulithic

In 1909 Wallace was forced to resign on account of ill health and moved to California. While there he invented and patented what is now known as Warrenite-Bitulithic, thus furnishing the answer to our second and third questions, viz.: can a bituminous concrete pavement be sealed with a hot sand mixture and if so how can this be done?

From his observation of how the skim patches had acted on Bitulithic, he recognized that it was impossible to produce a successful pavement by first laying and compressing the bituminous concrete mixture, then laying thereupon a thin layer of fine mixture, as this would scale off or push and shove in the same way as a bituminous coating on a portland cement concrete pavement, and that in order to be at all permanent, this fine mixture must be an integral part of the pavement. In other words, he must produce not a two layer pavement but a single layer pavement, consisting of a coarse, rigid mixture in the lower portion and a compact, dense, fine mixture at the top, so bonded together that there would be no plane of cleavage between the two.

This then required the use of two dissimilar mixtures, laid separately, but combined by rolling into one single, compact, rigid layer.

His method provides that there shall be first spread upon the foundation a relatively thick layer of bituminous concrete mixture and while this is still in a malleable condition, cover it with a rich bituminous sand or fine aggregate mixture and by compressing the two together, thus blend the fine mixture with the top of the coarse mixture whereby the two layers are bonded into one.

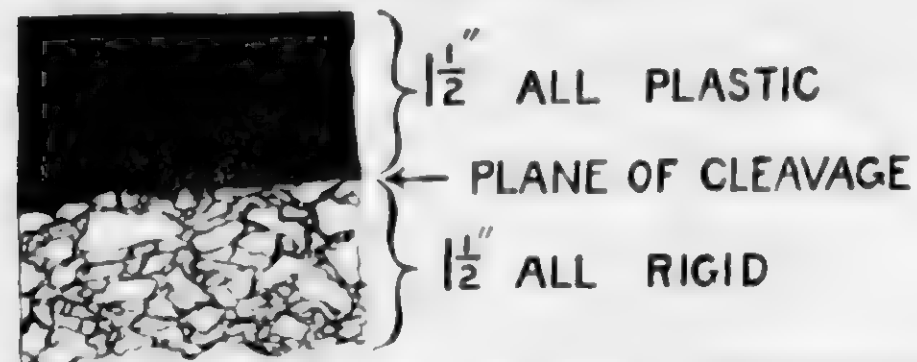
### Departure from Prior Practice

In order to do this, it is of course necessary to apply the fine mixture before the coarse mixture has had time to chill appreciably, which means that a supply of both mixtures must be on the street at all times and be laid concurrently. It also means that the paving plant must produce one load of fine mixture after approximately every fourth load of coarse mixture. This was such a radical change from all past paving practice that when his patent was brought to our attention the construction men were unanimous in declaring the method impractical and impossible. Everyone claimed that the plant could not change back and forth from one mixture to another; that in laying sheet asphalt it was always necessary to run binder at least one-half day, then change to surface mixture, as is still the practice when laying that pavement

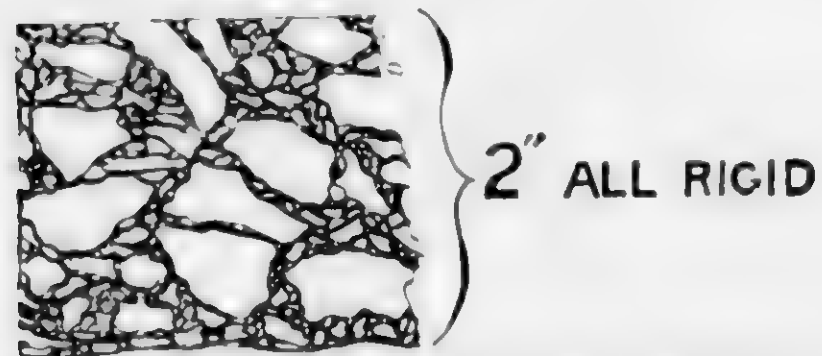


# The Highwayman of New Jersey

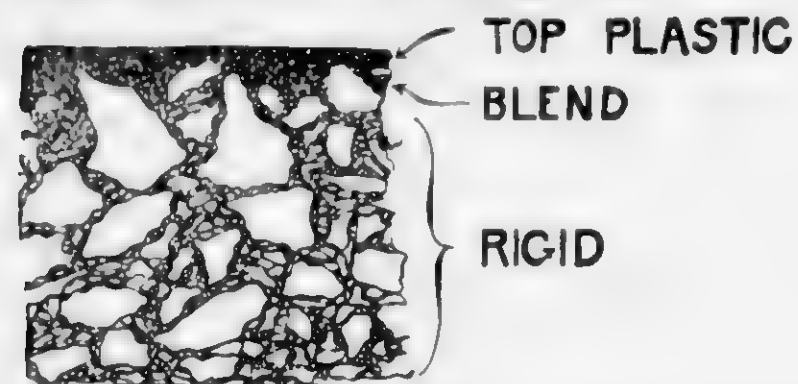
## SHEET ASPHALT



## BITULITHIC



## WARRENITE-BITULITHIC



They claimed that the men on the street could not possibly handle two mixtures at once; that the fine mixture at the surface would act as a cushion and therefore the roller could not thoroughly compact the coarse mixture below; however, notwithstanding their prophecies, since 1910 we have laid 20,182,100 square yards of this pavement, equal to 1911 miles of roadway 18 feet wide, as shown by this table—all of which, as far as I know has been successful.

### STATEMENT

To show total area in square yards of pavement laid in accordance with patents of E. C. Wallace under license granted by Warren Brothers Company and the ratio of same to the entire area of work laid under Warren Brothers Company license during the same period.

Year	Area Sq. Yards	Percentage
1910	874	0.3
1912	28,701	0.6
1913	16,250	0.3
1914	82,297	1.9
1915	298,425	6.6
1916	819,656	14.8
1917	1,529,770	29.3
1918	1,532,696	31.9
1919	3,021,296	40.4
1920	6,242,135	55.2
1921	6,610,000	87.5

Totals 20,182,100  
Equivalent to 1911 miles roadway 18 feet wide.

The first work in 1910 in New Bedford, Mass., was a demonstration area under heavy cotton mill traffic. This was watched for two years, more was laid in 1912, and then in 1913 we started generally to substitute it for the older type. At first it was difficult to get people to change, but as time proved the superiority of the new construction its adoption became general as shown in preceding "Statement."

In answering our fourth and final question, "In what respects is the final product an improvement over prior constructions?" it is necessary to understand clearly the structure of the several pavements under consideration.

For convenient reference I am showing herewith enlarged photos of vertical cross sections of a standard sheet asphalt, a Bitulithic and a Warrenite-Bitulithic pavement, each of which is a typical sample of its type, taken from a street in actual use.

### Comparison of Pavement Structures

By comparing these three pavements we find they are radically different in structure, as can be more plainly seen from the above diagram.

The sheet asphalt consists of two separate distinct layers of approximately equal thickness. Each layer is uniform in composition and therefore equally uniform in characteristics throughout its entire depth. The lower layer is all rigid. The upper layer is all plastic. There is a sharply defined irregular plane of cleavage between the two layers, which are bound together merely by the

cementing strength of the asphaltic coating on the uppermost stones of the binder course.

The Bitulithic is one single layer, uniform in composition and consequently in physical characteristics throughout its entire depth. It is just as rigid at the top as at the bottom.

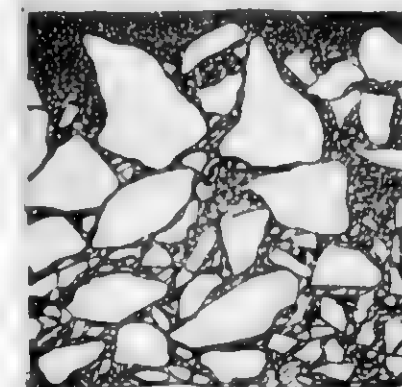
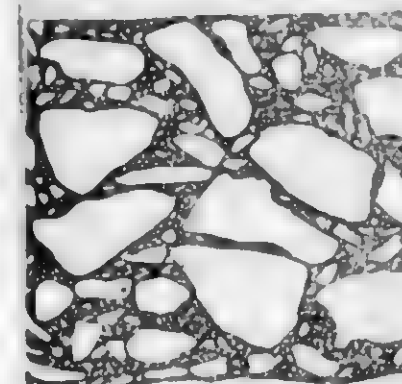
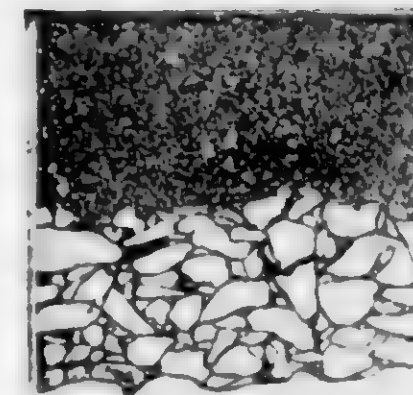
The Warrenite-Bitulithic, however, is a structure, which when completed, is not uniform in composition or physical characteristics throughout its depth; which when completed is not composed of two separate distinct layers of dissimilar composition and characteristics; but on the other hand, is one integral mass, in which the change from the composition of the coarse mixture of the lower portion, to that of the fine mixture of the upper portion, is not sudden, but is a gradual transition, through the zone of blending, whereby the physical characteristics of rigidity and stability of the lower portion, pass imperceptibly into the plasticity and malleability of the uppermost portion.

A careful study of these differences in structure will explain the difference of results obtained under traffic if we will recall several fundamental facts, the importance of which is frequently forgotten.

### Prior Pavements Most Compact at Middle

When compressing a layer of any bituminous mixture which is of uniform composition throughout the entire depth of the layer, such as sheet asphalt surface mixture, or a coarse aggregate bituminous concrete such as the original Bitulithic mixture, the layer will always be most compact at its center, and least compact at its upper surface.

If a newly laid mixture be sawed horizontally into three



COMPACTED MOST  
AT  
MIDDLE.

COMPACTED MOST  
AT  
TOP

layers of equal thickness, you will find that the specific gravity or weight per cubic inch of the middle layer is the greatest, of the bottom layer next, and of the upper layer the least.

The reason for this is twofold, first, as action and reaction must be always equal, the foundation pushes upward with the same force that the roller pushes downward. These two forces meet at the middle of the layer. Second, the degree of compaction imparted to the mixture depends upon the length of time which the particles of aggregate are kneaded back and forth by the roller and as this kneading action can only take place while the asphalt cement is warm and plastic, naturally the effect is greatest at the middle of the layer because the surface is cooled rapidly by the atmosphere, the bottom of the layer cooled less rapidly by the foundation, but the middle of the layer cools extremely slowly and is therefore compacted most.

This is a most important fact and is one of the reasons why it is necessary to flushcoat a Bitulithic pavement and why it is customary to sweep dry portland cement over a compressed sheet asphalt surface.

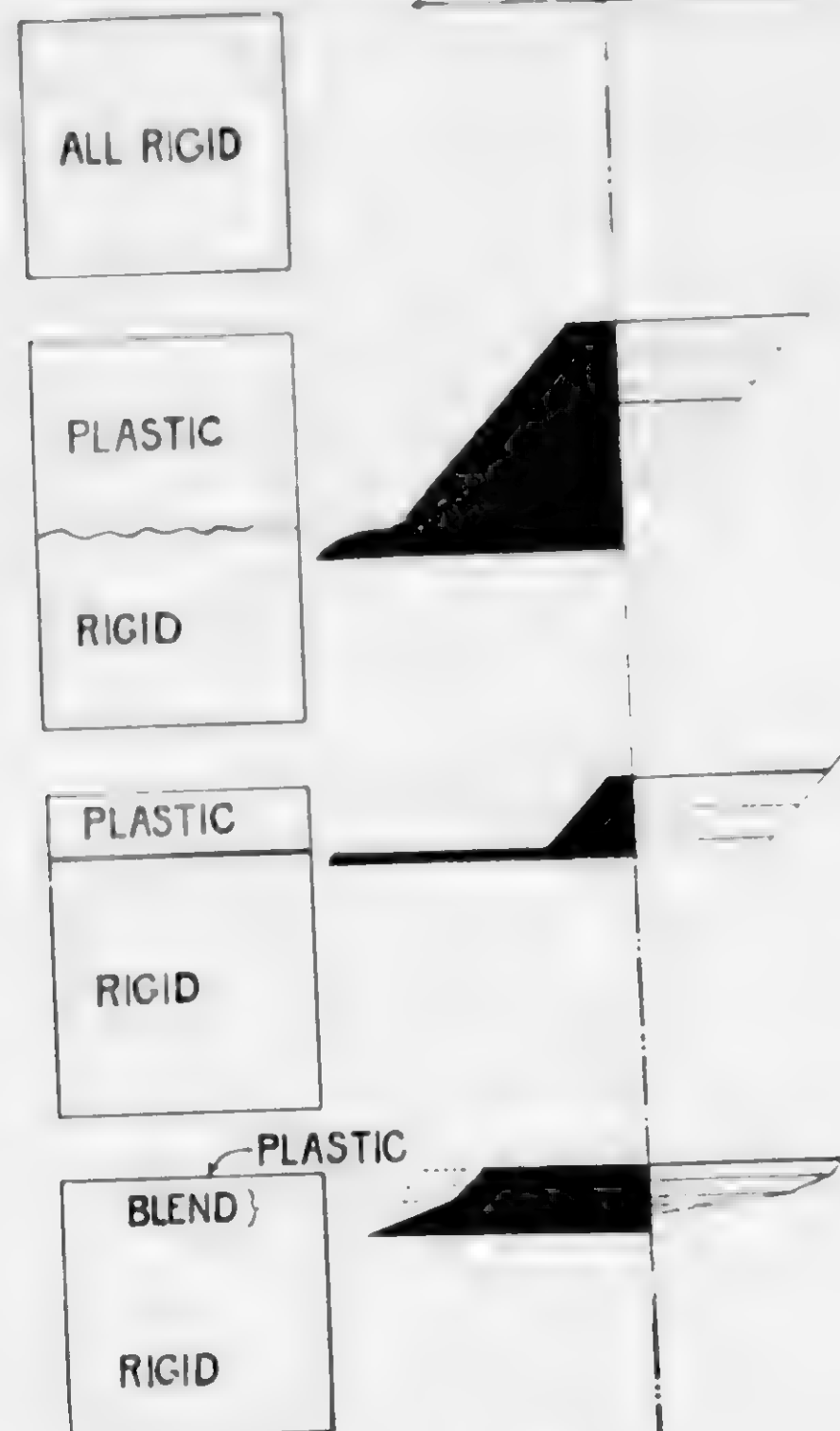
In the cases just mentioned, as the character of the aggregate and relative proportions of aggregate and bituminous cement are the same throughout, the middle of the layer remains more malleable than top or bottom during the progress of the rolling simply because of its temperature.

### Warrenite-Bitulithic Most Compact at Top

In the case of Warrenite-Bitulithic, however, the conditions are entirely different, because the layer is not of uniform composition throughout, and while the middle of the layer remains hot longer than either the surface or the

# The Highwayman of New Jersey

7



bottom, it must be remembered that the fine aggregate mixture at the surface is more malleable and plastic than the underlying coarse mixture, irrespective of such difference of temperature obtained under all except very extreme weather conditions.

When the roller first passes over the fine mixture it presses it down into the spaces between the uppermost stones of the coarse mixture; also whenever the fine mixture lies on top of a stone, the weight of the roller is transmitted to the stone and presses it down into the mixture. The foundation of coarse resists this pressure, or pushes upward as before, and the crowding of the stones together squeezes the fine mortar of the coarse mixture upward until it meets the fine mixture of the upper portion coming down. At that time the compaction or consolidation of the coarse mixture is complete and the lower and central portion of the structure is so rigid that the roller cannot force any more of the plastic fine surfacing mixture into it, therefore the kneading action of the final rolling must necessarily compact this fine mixture at the immediate surface to a far greater degree than it can compact the immediate surface of any other type of pavement, and therefore Warrenite-Bitolithic is the only bituminous pavement which at time of completion is compacted to a greater degree at the upper surface than at a lower depth.

## Traffic Stresses

Moving traffic on any pavement tends to push the im-

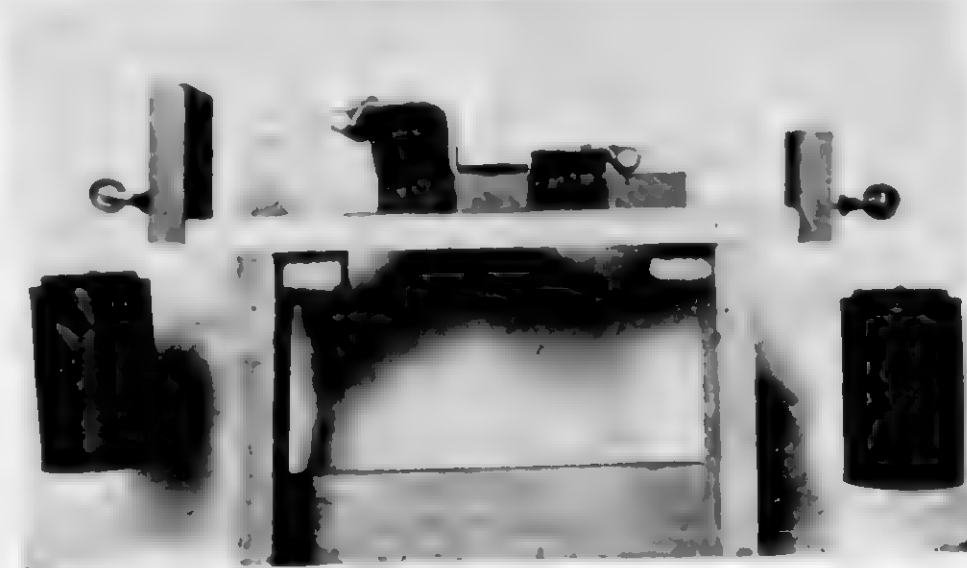
mediate upper surface ahead as well as sideways, and these stresses must be absorbed by the wearing surface section itself, or by it and the underlying binder course or foundation.

In the accompanying diagram I have attempted to indicate how the results of such stresses are dependent upon the thickness as well as upon the character of the wearing surface layer.

The four blocks at the left of the diagram represent four distinct types of construction as follows:

- 1st. Original Bitolithic=Rigid throughout entire depth.
- 2nd. Sheet Asphalt=Plastic surface on rigid binder both layers of approximately equal thickness.
- 3rd. Bituminous Coated Portland Cement Concrete=Thin plastic mat, cemented by a film of bituminous cement to a rigid base.
- 4th. Warrenite-Bitolithic=Plastic surface blended with a rigid lower portion.

The black horizontal lines to the right of the vertical zero line are intended to indicate merely in diagrammatic form how the horizontal thrust of traffic decreases from the surface downward, and, conversely, the shaded areas to the left of the zero line, to indicate how the potential resistance of the pavement decreases from the bottom upward.



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In the case of Warrenite-Bitolithic, however, on account of the blending of the fine plastic mixture with the rigid

concrete, the stresses are distributed throughout the entire depth, it varies in thickness from 1/2 inch to 1 inch, and the water content of the concrete is 10 to 12 per cent. The concrete is placed by the top of the concrete, and the sand machine is used to apply pressure to the concrete. The sand machine is used to apply pressure to the concrete.

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In order to demonstrate the behavior of the concrete under stress, a series of photographs were taken. The photographs show the concrete under stress, and the sand machine is used to apply pressure to the concrete.

The two samples are shown in the photograph. The sample on the left is a sample of concrete, and the sample on the right is a sample of concrete.

The lower pictures are actual photographs of the samples after two to two and a half hours of temperature of 10 degrees to 82 degrees F.

These show that while the concrete is under stress and finally was torn within its body, the concrete was entirely unaffected.

In making the above experiment, naturally the samples were at the same temperature throughout, however, as already mentioned, this condition never exists in a pavement in actual use. On a normal summer day the upper





	A	B	C	D	E
SIZE OF PARTICLES	10 MESH	50 MESH	100 MESH	GRADED 10-200	200 MESH
VOIDS	40%	40%	40%	30%	50%
TIME REQUIRED TO PASS MIN.	1	22	89	3	1

surface is heated by the sun to a relatively high temperature, often to well over 100 degree F., and toward the end of the day the heat will have penetrated a considerable depth.

While in this condition, the upper portion of the wearing surface layer is relatively much more plastic than the lower portion, therefore its relative resistance to deformation is less than has been indicated in the diagram (page 6).

During the night, however, the upper exposed surface of the pavement radiates its heat, and by early morning may be considerably cooler, and therefore in the case of a layer of uniform composition such as Bitulithic or Sheet Asphalt Surface mixture, the upper surface may be less plastic than the center of the layer, thus presenting to traffic a "tough crust" supported by a plastic mass.

The effect of traffic under such conditions may be either deformation in the body of the surface layer, or, if the difference in temperature is extreme, possibly fracture of this tough upper crust.

In the case of the Warrenite Bitulithic, however, this difference in temperature merely makes the immediate upper surface more nearly resemble the lower portion as to rigidity and therefore as the two are blended firmly together no harm results.

## Blending

An idea of the strength of the bond formed by this blending of the two mixtures can be obtained from an examination of this sample of Warrenite Bitulithic which has been sawed horizontally into four slices, also by an examination of this series of photographs of another sample cut similarly (pages 12 and 13).

We have already seen how the Bitulithic pavement was affected by moisture after the flushcoat bitumen had been worn off by traffic, also seen that it was not so dense or compact at the surface as it was lower down; however, it remains to be shown how the surface of such a bituminous concrete mixture composed of a mineral aggregate containing much less than 21% of voids can be really sealed with a hot sand mixture composed of an aggregate containing much more than 21% of voids.

## Impermeability

The answer is simply that the permeability of a pavement to water is dependent far less upon the combined total volume of all the interstitial spaces in the aggregate, or, as usually referred to, "the percentage of voids," than it is upon the size of each individual void.

The experiment shown on the above diagram shows this fact very conclusively.

In this experiment we used ordinary 7 in. glass U tubes of approximately  $\frac{3}{4}$  in. internal diameter. The same volume of aggregate was compacted as uniformly as possible in the bottom of each tube, and as the weight of aggregate used in each varied consistently with the percentage of voids in each aggregate we feel the degree of compaction was fairly uniform in all.

Tube A—contained sand passing No. 10 retained on No. 20 mesh sieve.

Tube B—contained sand passing No. 50 retained on No. 80 mesh sieve.

Tube C—contained sand passing No. 100 retained on No. 200 mesh sieve.

Tube D—contained sand graded from No. 10 to 200 mesh sieve (10-200).

Tube E—contained dust passing No. 200 mesh sieve.

The sands in A-B-C each contained 40% voids.

The graded sand in D contained 30% voids.

The 200 mesh in E contained 50% voids.

One leg of each tube was filled with water and the time required for the water to pass through the aggregate until the water level was the same in both legs of the tube was measured in each case.

These times were:

Tube A—10 mesh sand—1 minute.

Tube B—50 mesh sand—22 minutes.

Tube C—100 mesh sand—89 minutes.

Tube D—Graded sand—about 3 hours.

Tube E—200 mesh dust—at the end of 24 hrs. there was still a difference of  $\frac{1}{4}$  in. in level and the water had apparently stopped.

It should be noted that the percentage of voids in tubes A-B-C is the same—40%; also that the dust in Tube E contained the highest percentage of voids, yet on account of the infinitesimal size of the individual voids it was the most impermeable.

As a check on this experiment, we then placed in these percolators, equal volumes of the coarse and fine aggregates used in a Warrenite-Bitulithic pavement. The coarse aggregate contained 14%, and the fine aggregate 30% voids. The percolators were then filled with water and the time required for a given volume of water to filter through the aggregate was measured. It filtered approximately four (4) times as fast through the coarse as through the fine aggregate.

As an ocular demonstration of how the compactness or denseness of a surface depends not upon the percentage of voids but really upon the size of the individual voids, I would call your attention to this box in which there are four (4) bituminous mixtures, of  $\frac{3}{4}$  in. stone,  $\frac{1}{2}$  in. stone, 10 mesh sand, and 50 mesh sand respectively. These blocks are identical in the following respects:

- Total volume of block = 27 cubic inches.
- Mineral aggregate in each consists of particles of uniform size.
- Mineral aggregate in each case contains approximately 40% of voids.
- Total volume of voids in each block equals approximately 10.8 cubic inches.
- Each block contains just sufficient asphaltic cement to coat the particles.

Therefore if the compactness or denseness of the surface depended upon the percentage of voids (total combined

volume of voids) then the denseness of these blocks should also be identical.

An examination of the surfaces of the blocks (see photos, page 10) shows plainly that the compactness of the surfaces is not identical but increases as the size of the particles used in the mineral aggregate decreases.

This is even more plainly shown by the sawed cross sections of the blocks (see photos page 11).

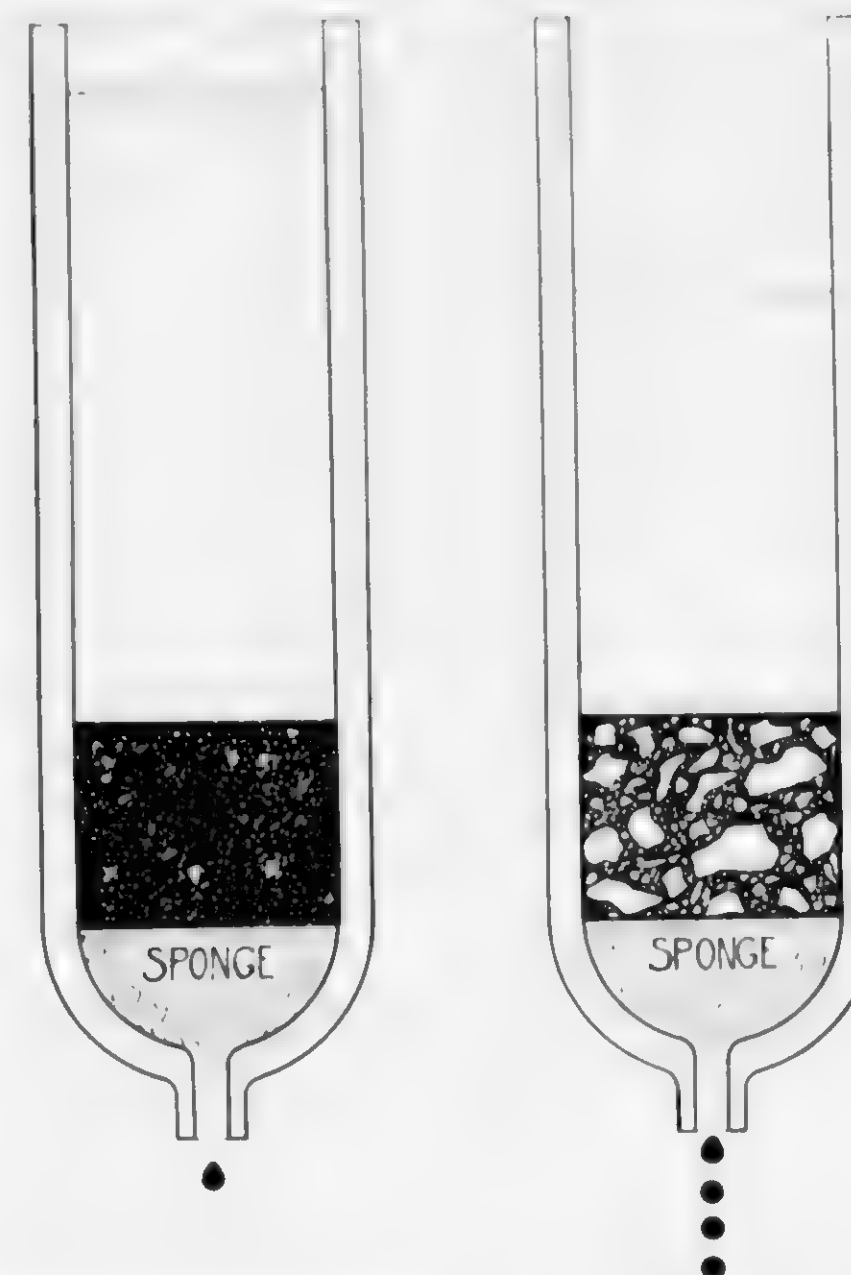
In these photographs the spaces between the white stones appear black due to the coating of asphaltic cement on the stones at the back of such spaces or voids.

From these photos it is clear that the 10.8 cubic inches of voids in the  $\frac{3}{4}$  in. stone block are composed of relatively large sized individual voids, the structure resembling the coarse broken stone placed at bottom of a drainage ditch.

In the case of the block composed of 50 mesh sand the same 10.8 cubic inches of voids consists of an almost infinite number of microscopic individual voids, hence the texture of the surface and cross section of the block more closely resemble that of roofing slate.

## Denseness of Surface

One of our laboratories recently demonstrated this denseness of a surface by the use of two sieves as shown on the diagram, page 14. The sieves were each made four (4) in. square. The one at the left was made of  $\frac{1}{2}$  in. bars with the openings  $\frac{1}{2}$  in. square. The other sieve was a standard 200 mesh sieve, in which the diameter of the wires was the same as the width of the openings. Therefore in each sieve the total area of holes was 4 square inches or 25% of the area of the screen, yet while water could be poured freely through the  $\frac{1}{2}$  in. sieve, the 200 mesh sieve would hold water  $\frac{3}{4}$  in. deep. The reason being the tremendous difference in the size of the individual openings, the 4 sq. in. of openings being divided into only 16 holes in one case and into 640,000 holes in the other.



It is for this reason that the fine aggregate mixture at the upper portion of the Warrenite-Bitulithic makes it "densest at the top" as described in the patent.

This term "densest at the top" when applied to pavements is likely to be confused with "density", or "specific gravity."

The dictionaries define "dense" as meaning compact, close, thick, closely compacted, etc.

## Denseness vs. Density

In some senses of the word "density" is synonymous with "denseness"; in another sense "density" is synonymous with "specific gravity"; but "denseness" and "specific gravity" are never synonymous. For example, one might speak of the "denseness" or "density" of population; on the other hand the specific gravity of the population would be meaningless. Conversely while one might ask for a special "density" or "specific gravity" of motor gasoline and be understood, it is hard to tell what he would receive if he asked for that "denseness" of gasoline.

While the word "density" is not once used in the Wallace patent and the meaning of the word "densest" is perfectly clear from the context, some people have felt confused with this term "densest at the top", knowing that a coarse aggregate stone mixture containing but a small percentage of asphalt must have a greater specific gravity, or density, than that of a sand mixture containing a large percentage of asphalt.

In order to clear up any possible confusion on this point, I would ask you to examine these three (3) small blocks, which are of equal volume.

They were prepared by first determining the percentage of voids in the sand, then mixing a given weight or volume of the sand with just sufficient volume of the filling medium to fill the voids.

The filling medium in block A was paraffine wax, in



Size of Particles  
In Each Block

Stone

Surface



Stone

Surface



10 Mesh Sand

Surface



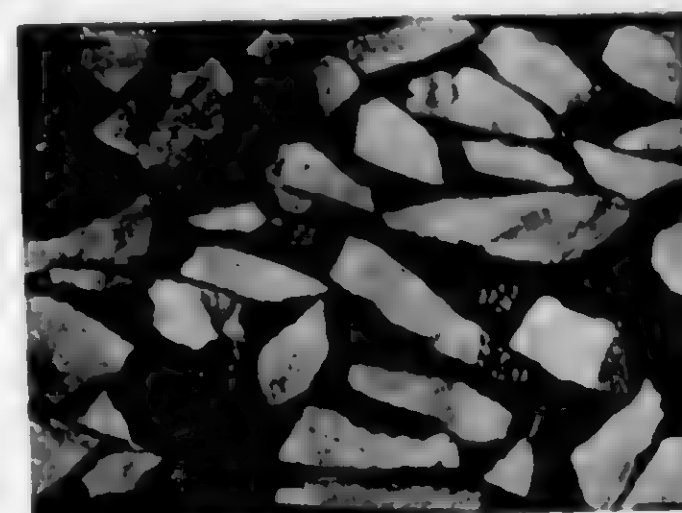
50 Mesh Sand

Surface

Size of Particles  
In Each Block

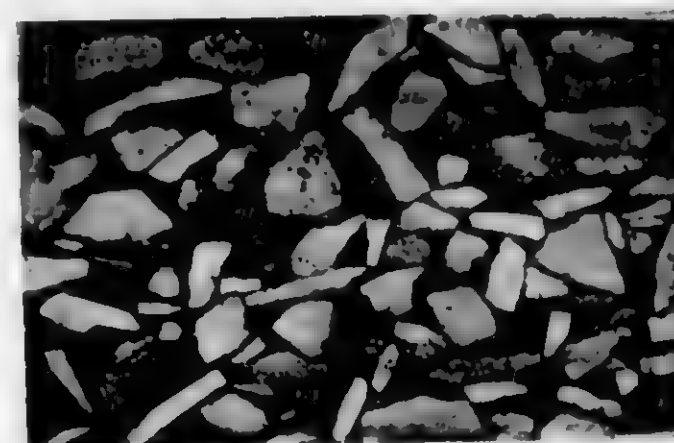
Stone

Natural Cross Section



Stone

Sawed Cross Section



10 Mesh Sand

Sawed Cross Section



50 Mesh Sand

Sawed Cross Section

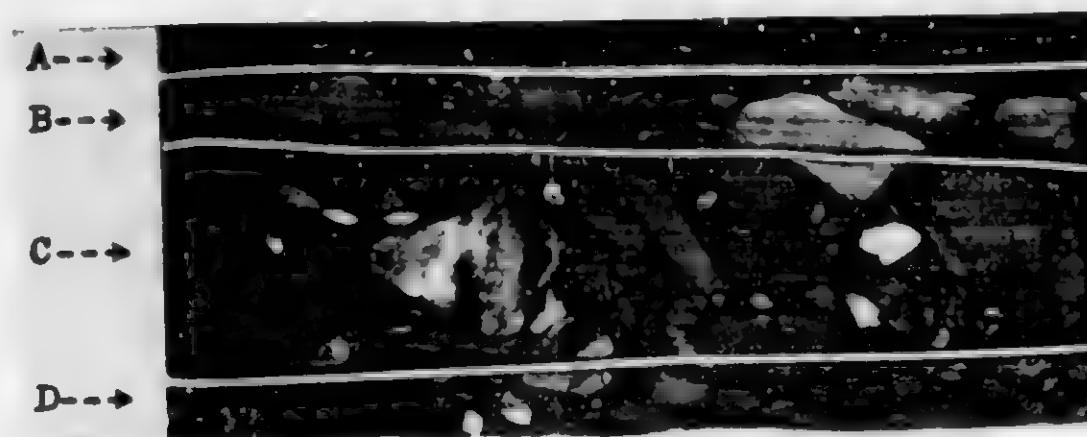




# The Highwayman of New Jersey

## Warrenite-Bitulithic Wearing Surface

Laid 1" depth on Dense Bituminous Concrete Base



Sample sliced horizontally, color to the lines in photo into four 1" layers (A, B, C, D)

While this sawed section has shown the Fine Surface Mixture is blended and bonded with the top of the Coarser Mixture, this condition is more clearly shown in the following photos.

### Upper Side of Slab—"A"

This is the surface exposed to traffic

Photo shows the fine granular, compact character of the Fine Surface Mixture which seals the surface and protects the Coarse Mixture below.

### Upper Side of Slab—"B"

being surface exposed to traffic

being lower side of Slab—"A"

This photo shows a further blending of the two mixtures, and when compared with Lower Side of Slab—"A" shows an increased proportion of the coarse mixture and a decreased proportion of the fine mixture.

### Lower Side of Slab—"A"

$\frac{1}{8}$ " below surface exposed to traffic

Photo shows that in the lower portion of Slab "A" the two mixtures blend. The "coarse particles" seen in the photo being in reality the tips of stones protruding upward into Slab "A" from the coarse mixture below.

### Lower Side of Slab—"B"

$\frac{1}{8}$ " below surface exposed to traffic

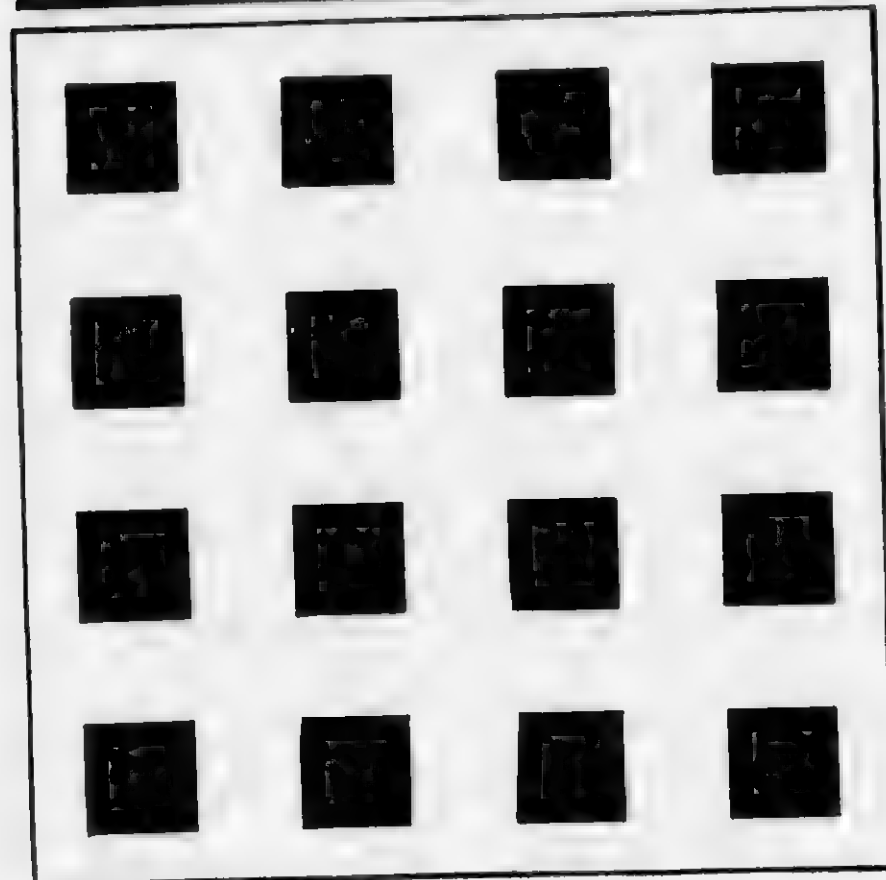
$\frac{1}{8}$ " below upper side Slab—"B"

Photo shows that (in this sample) at this depth, the structure consists substantially of the coarse aggregate asphaltic concrete mixture.

(The depth at which this takes place will vary with conditions under which pavement is laid.)



No. 200 MESH SIEVE



1/2" MESH SIEVE

Size of each Sieve—4"x4"  
 Area of each Sieve—16 square inches.  
 Area of holes in each Sieve— $\frac{1}{4}$  square inches.  
 Area of holes in each Sieve— $\frac{1}{4}$  of area of Sieve.  
 Number of holes in 1/2" mesh Sieve—16.  
 Number of holes in No. 200 Mesh Sieve—640,000.

block B asphalt cement, in block C a mixture of litharge and glycerine.

As the size of the voids in each block are the same and the filling medium was just sufficient to fill the voids in each case, the blocks must be of equal denseness, however, no two are of the same density.

The density or specific gravity of the blocks are

Block A—using Paraffine—1.96

Block B—using Asphalt Cement—2.00

Block C—using Litharge—3.54

The specific gravity of the sand was 2.65 or more than blocks A and B and less than block C. This seems to be conclusive proof that when comparing different mixtures, specific gravity is not a measure of "denseness."

#### Increase in Stability

Another very important point which may not have occurred to you is that by blending this fine aggregate plastic mixture with the top of the coarse aggregate bituminous concrete, we actually increase the stability of the rigid concrete. This may seem paradoxical, but it is a fact.

While we all appreciate that the stability of waterbound macadam is due to the interlocking of the coarse, medium and fine sized particles of stone, yet frequently forget that this stability is not due merely to the selection of the proper proportion of each of those several sizes.

An engineer might easily compute very closely just what percentage of each size stone is required, but if he should specify that said sizes be mixed together in such proportions and then be spread in one layer, no contractor would ever be able by rolling or any other means to compact that layer into a stable macadam road.

The real secret of MacAdam's success lay in his process of laying, viz.: spreading and compacting a layer of coarse stone, then spreading there-upon a layer of finer stone and compressing these smaller particles into the space between the tops of the underlying coarser stones. By this method each stone was firmly seated on a solid base and what is more important, the top point of each stone was given lateral support by the smaller stones wedged in around its top.

The importance of this will be seen when one remembers that as the foundation remains stationary there is no tendency to displace the bottom of any stone but on the other hand the effect of moving traffic tends to overturn the stones and the only way to prevent this is to give the top of each stone lateral support.

This is exactly what is done when the fine mixture of the Warrenite-Bituliithic is forced down into the spaces between the tops of the upper stones. On the other hand, if a bituminous concrete is rolled as was done in the old Bituliithic, pushing the stones down and forcing the fine mortar up from the bottom, then the mortar between the bottom of these stones is highly compressed but the mortar

between the tops of the stones is not under pressure, and merely acts as a filler.

In other words, the upper stones in this present pavement may be compared to a stiff leg derrick, but those in the older pavement to a flag pole set in a solid foundation.

We have already shown that in the practical laying of coarse aggregate bituminous concrete mixtures, it was impracticable to use aggregates containing a minimum of fine material and hence a maximum of stability on account of the fact that these aggregates were so rigid that when compressed by the roller a large percentage of the uppermost stones were crushed; also that after the flushcoat mat had worn off the traffic fractured and even shattered a still greater number of these exposed stones, hence it was necessary to use a compromise design in which an excess of fine aggregate was added to the mixture so as to cushion the stones in the body of the mixture under traffic. This, however, did not protect the uppermost stones and did reduce the stability of the aggregate to a material extent.

These two weaknesses are overcome by the use of the fine aggregate mixture at the surface in accordance with present methods, because this acts as a cushion for the roller at time of construction, also protects the upper stones from the abrasion and impact of traffic. For these reasons, when using this method of construction it is possible to use a more stable and rigid aggregate for the lower coarse mixture than could be possibly used under the old methods of compressing the bituminous concrete and then temporarily sealing the surface with flushcoat bitumen.

In conclusion we may summarize "The Advantages Secured by Sealing a Bituminous Concrete Pavement with a Hot Sand Mixture" or in other words, the advantages of the Warrenite-Bituliithic pavement laid under the Wallace patents as follows:

- It can be laid on any suitable foundation.
- It will not crack like a rigid pavement such as portland cement concrete.
- It can be laid quickly on macadam or bituminous concrete base, thus avoiding barricading the road and requiring detours for long periods during construction.
- It has all the merits of the macadam road, the sheet asphalt pavement, and of the best coarse aggregate bituminous concrete.
- It has overcome all the weaknesses inherent in each of these structures.
- It is not merely a bituminous concrete with a temporary sealcoat mixture, but is really a distinct product radically different in composition, structure, physical characteristics and wearing qualities from any pavement hitherto constructed.



## Discussion of Mr. Perkins' Paper

By Julius Adler  
Deputy Chief, Bureau of Highways, Philadelphia, Pa.

For the purpose of discussion, the paper just presented may be considered under two headings:

- I. The merits of the mixed seal coat as compared to the flush seal coat;
- II. The merits of the particular method of construction described, and of the resulting pavement structure.

- I. Under the first heading, are included the following:
  - (a) Greater and more permanent water-proofness than the old flush seal coat;
  - (b) Cushioning effect during rolling, permitting the use of the most desirable grading of coarse aggregate;
  - (c) Cushioning effect under traffic, protecting the coarse aggregate from the direct impact and abrasion of traffic.

Those who have had experience with the older form of asphaltic concrete construction, and who have taken pains to observe their behavior in service may be disposed to dispute some of these claims of superiority by citing examples of the old pavements which have given very satisfactory results. Viewed from the standpoint, however, of the average results obtained from a considerable number of examples of pavements, it should be conceded that the mixed seal coat has the qualities claimed and that one of the older pavements, which has performed well without the assistance of hot mix seal coat, should have done even better had this feature been included in the original construction.

II. As to the merits of the method of construction described and the resulting pavement structure, we have been told that the present form of Warrenite-Bituthic is fundamentally different from any other type of bituminous pavement which has preceded it, possessing a very desirable degree of uniformity of compression from top to bottom; and, further, differing from sheet asphalt in that the latter contains a well defined cleavage plane between the upper and lower courses as contrasted with the Warrenite type where the fine mixture is said to blend with the coarse mixture through a depth varying from  $\frac{1}{4}$  to  $\frac{3}{4}$  inches from the surface of the pavement.

While there can be no doubt that a difference exists in this respect between the two pavements, since the coarse mixture in the sheet asphalt has been rolled to a nearly uniform surface prior to spreading the fine mixture, there is room to question whether the resulting condition can properly be described as a cleavage plane. To the contrary, if the binder course is properly designed and laid, a very satisfactory mechanical bond (in addition to the adhesive bond, which alone has been attributed to this type of construction) can be obtained.

With respect to the single compression process used on the W. B. pavement, there can be no doubt of the very effective combination of the fine and coarse mixtures which results. It may be of interest, however, to know that as

early as 1914, in the City of Philadelphia, a hot mix sand seal coat was used on bituminous concrete of coarse grading, on which work the seal coat was spread immediately after the bottom course had been lightly rolled to an even surface. A number of stretches of this pavement were laid in 1914, practically all of the work being done under favorable warm weather conditions and these pavements have given very satisfactory results. Had the weather been cold at the time this work was done, it is very questionable whether as good results would have been obtained. It must be borne in mind, however, that when any bituminous mixture is spread in a thin coating in cold weather, there is a possibility of a rapid chilling and subsequent surface sealing unless rolled almost immediately after the spreading.

The next point for consideration in the matter of structure of the pavement under discussion has to do with the thickness of the seal coat. It would appear that this form of construction is based partially upon the principle that an upper plastic mixture is desirable only in sufficient quantity to give a proper combination of water-proofing and cushioning. In the case of the W. B. pavement, this has been set apparently at an average of  $\frac{1}{2}$  inch of fine graded mixture. In the case of the old sheet asphalt pavement, the upper mixture was usually 2 inches. Experience has proven beyond any doubt that the latter depth is too great under modern heavy traffic and very difficult to keep from waving. The result is that the modern heavy traffic asphalt pavement usually has a  $\frac{1}{2}$ -inch surface course. From the standpoint of water-proofing, this is undoubtedly thicker than necessary, and from the standpoint of cushioning it also seems very probable that it is greater than necessary. It has been found possible, however, with a well graded binder mixture and under reasonably favorable weather conditions to lay surface mixtures as thin as  $\frac{1}{4}$  inch. With poorly graded binder course, and working in cold, windy weather, a mixture as thin as this is likely to develop waviness and excessive honeycombing, due no doubt, to the rapid and unequal chilling beginning at the surface. Assuming, however, that such a combination can ordinarily be made, the fundamental difference between the two pavements is reduced to that between a 1-inch surface of fine mixture rolled in a separate operation, and a  $\frac{1}{2}$  inch similar surface combined with the lower course in a single operation. The apparently undetermined questions are, first, whether a  $\frac{1}{2}$ -inch mixture is ample to give proper cushioning effect under all variations of traffic from light to heavy; and, second, whether in the event that a thicker surface mixture would be desirable under heavy traffic, the anchoring effect of the more rigid binder course which has been so clearly brought out by Mr. Perkins in his discussion of the variation in stresses and resistance to stresses at varying depths in asphalt pavements is sufficient to retain in place and free from waving, a coating as great as 1 inch in thickness of what has been described as an essentially plastic mixture.

## The Proper Methods to Follow in the Control of Paving Mixtures

By H. S. Mattimore  
Engineer of Tests, Pennsylvania State Highway Department

As used in the title of this talk, the term control is a very broad one, as in my mind when we mention the control of paving mixtures we would naturally include all supervision by the Municipality or State covering materials, and the actual placing of the pavement. There is further control or supervision which is left entirely in the hands of the contractor. Although this latter will not be discussed, it must be remembered that the cooperation of both interested parties is necessary in order to obtain desirable results.

It is always difficult to lay down any line of procedure and definitely label it as the proper method, in fact, I doubt if the same system adopted in any municipality or state can necessarily be considered the ideal one for another state or municipality to follow. The procedure will be effected in any section by the organization, the experience of the engineers and inspectors in this organization, and finally by the efficiency of the various bureaus in which the organization is divided. There are certain systems of control with which I am familiar, and under which successful work has been accomplished, and I have assumed that naturally this is the line along which the treatment of this subject would be most valuable.

I would interpret that control of paving mixtures, as used in the title of this talk, would treat of the determination of qualities for the various materials entering into the mixture and the supervision of the placing. All materials entering into any paving mixture should be tested, and naturally, as the laboratory has skilled men and equipment for this purpose, this should be under their supervision. Also, mixtures should be designed, that is, whether a pavement is laid of concrete or of bituminous material, we must have a predetermined mix to be used in proportioning the different ingredients. This mix is determined usually as a result of laboratory tests combined with service test. The intelligent way to determine the mixture to be used should be by cooperation between the field and laboratory forces. The laboratory should be familiar with the theoretic data concerning mixtures of this type, and also have data on the behavior of such type when subjected to traffic. The construction engineer should be able to give advice regarding past experiences in the use of various mixes from the standpoint of economical manipulation and finally the efficiency of service. This latter will include maintenance costs, etc.

The mixture as determined before hand as one to be approximated for specifications and bidding purposes, will in many cases be subjected to change to fit available aggregates, and such changes should be entirely under the control of the laboratory. These changes of mix occur more frequently in the bituminous types than in the concrete, as in the former, the difference in grading of the available materials has more effect on other ingredients than in the latter. Also, the mixtures of bituminous pavements depend on traffic and temperature conditions, while the usual practice in concrete pavement is to standardize one mix within large sub-divisions such as municipality or state.

The control of bituminous paving mixtures during construction is connected very intimately with determination tests. For instance, in the wearing surface of a sheet asphalt pavement, asphalt, sand and filler are mixed in certain proportions. In order to control this intelligently, daily samples should be submitted to the laboratory to determine if these proportions are being obtained in the actual mixture. Naturally this work must be closely supervised by the laboratory. Under our scheme of organization the inspector on bituminous plants is assigned from the construction forces, but he is trained and his work is supervised by inspectors from the laboratory. We have found that efficient control can be maintained in this manner and results on tests are available to the plant inspector within forty-eight hours at a maximum.

The status of the laboratory in the laying of bituminous pavements will depend to a large extent on the general experience of the field organization in that type of pavement. Trained construction engineers with a large amount of experience with this type are fully capable of taking full control. In cases where the construction engineer has a limited experience with this type of pavement he should have expert advice regarding placing temperature, proper raking, rolling, and methods for avoiding or repairing honeycombing, etc. The ultimate end in this instruction is to make the inspector self-contained so far as the laying and manipulation of this type of pavement is concerned.

The control of concrete pavements, in the main, should be directly under the construction engineer. Such factors as proportioning of mix and time of mix should be regulated by specifications. As these depend to some extent on test data, naturally the laboratory is consulted regarding them. Consistency is controlled by the inspector after proper instructions. The determination of the quality of the mix by means of test specimens, naturally, is a laboratory function. It is quite practicable to train construction inspectors in the making of specimens, and to my mind this is a desirable procedure, as the inspector becomes thereby, intensely interested in the quality that he is securing, which has a tendency to increase his efficiency.

I do not wish to be misunderstood in the above discussion regarding control of paving mixtures. It might seem as though we are working under a dual authority, which is far from the actual conditions. In fact, under our scheme of organization, the district engineer is in charge of all construction and maintenance within his district, which is usually from four to seven counties, depending upon the amount of construction. He is responsible for the quality of all the construction under his authority, and in order to assume this responsibility he must have full supervision. On certain types of pavement such as many of a bituminous class, the quality of the work secured is regulated to a large extent by the proper grading and proportioning of several ingredients. The ascertaining of this quality depends on tests. The district engineer naturally has no facilities to carry out this work, and such details are left to the laboratory. In cases of orders being issued to the contractor of a major nature, great pains are taken to see that such are taken through the laboratory engineer; in fact, in all types of pavement the laboratory acts in the supervising capacity to the district engineer, and he feels sure that he will receive prompt advice on any questions regarding paving mixtures. This naturally leads to an excellent cooperation. There are absolutely no signs of dual authority, and excellent progress and qualities are the result.

The inspection and methods for the control of the quality of materials entering into any paving mixture is a large factor in determining the final quality of the pavement. The actual testing of materials has been well controlled for a number of years. Efficient methods for the testing of highway materials are used extensively, and although many of them have not been standardized, they are well known and followed in highway laboratories.

The weak feature regarding materials in the past, has been the want of control on the materials actually being used in the mix. This was not peculiar to highway work, in fact, it was a general condition found throughout all construction. Within the past several years attempts have been made to correct this weakness, and many highway organizations have made provisions to carry on this work, and it has been found that it is not only an excellent safeguard, but also an economic procedure.

At the present day when we are studying the design of pavements and recognizing the effect that the quality of the material has on the ultimate result, no thinking engineer would question the necessity for the control of materials.

## Discussion of Mr. Mattimore's Paper

By R. B. Gage  
Chemical Engineer, New Jersey State Highway Department

als. The phase of this subject that is of most interest would be the organization and methods of this control. It is questionable just how much could be done toward standardization of an organization for this purpose. Many conditions peculiar to different highway organizations would have their effect on the method to be followed.

There are two distinct methods followed in organizing for this material control; in one the laboratory or testing bureau has full control of all materials and has proceeded to the stage where a material inspector is assigned to each contract. The other extreme is where the laboratory tests the materials only, and the control is maintained through the construction corps. The method followed in our organization might be considered a mean, in that, the supervision of all materials is under control of the laboratory; but in cases of field inspection on a contract, the work is actually done by the construction inspector. During the early stages of organization, great pains were taken to instruct this inspector in methods of field testing for various materials, and as he is able to give this material work the proper attention along with his inspection of construction, it will be readily seen that it is an economic procedure; and further as the inspector of construction is responsible for the finished results, he takes great pains in the testing of materials, the quality of which he knows is a great factor in determining these results.

Another question which often arises in regard to inspecting and field testing of materials, is whether this should be carried on at the source of production or upon delivery. I realize in discussing this phase of material control that very definite views have been stated regarding both methods. I consider that where at all practicable, that cement and brick should be tested and inspected at the source of production, also where any considerable amount of steel is used for structural work it is advisable to have such tests and inspections at the plant, in fact, it is the only way to control this latter. For fine and coarse aggregate, I have found during past experience, that it is a practicable procedure to make this inspection and field test upon delivery at the contract. I realize that this procedure is not agreeable to all producers, in that they seek to know whether this material will be acceptable before it leaves the plant, but I do know that skilled producers make it a business to be familiar with the specifications and assure themselves that it does meet these specifications before it leaves their plant, and they do not need an inspector from

The writer would like to further emphasize many of the points brought out in Mr. Mattimore's paper. It is very evident that if the maximum amount of benefit is to be secured from the work being performed, regardless of the type of construction or methods used, there must be close cooperation between the field, engineer, and laboratory forces. Each has its specific duties to perform and each should welcome all the assistance it can secure. If the members of one division are indifferent or jealous of those in another division, it is self-evident the cooperation necessary to secure the best results will not be secured. If engineering or methods of construction are defective or not properly performed, the quality of work is sure to be inferior to what would otherwise be secured, regardless of the character of the materials used; while on the other hand, when inferior grades of materials are permitted to be used, it is seldom the engineering or construction methods are so changed as to overcome the handicap thus caused, and again, we will find an inferior grade of work.

In certain localities specifications are so prepared that the acceptance or rejection of work is based upon the character of the finished product, or in other words, the contractor can use any materials, or method of construction he desires, provided he can produce a product that will have the characteristics defined by the specifications. When the finished product fails to comply with these requirements, the contractor is compelled to replace all such work with a product that will comply with the specification's requirements. If such a procedure was followed in New Jersey, the writer does not hesitate to state that most of our contractors would have been put into bankruptcy long ago.

There is no doubt but that the Highway Department is in a much better position to locate the deposits of raw materials and determine the character of all materials used in Highway construction at a much smaller cost than can be done by the individual contractor, also, that it is to the best interest of all concerned to prevent the use of inferior grades of material or methods of construction, for the chief object in the construction of roads is to provide durable and desirable types of pavements for the use of the public at as early a date as possible. The public detests detours, and is only indirectly interested in any quarrels between the contractors and the Highway Department; consequently, the rejection of a completed pavement only delays the opening of the road to travel, and increases the cost of the work to the contractor. Since most of the moneys received by contractors doing Highway work comes from the same source, it means, that the State has to eventually pay for all work that has to be replaced by the contractor. It is thus quite evident that the most economical and satisfactory method to follow is to prohibit the use of inferior grades of materials and methods of construction to such an extent that inferior grades of work will be eliminated.

The policy of the New Jersey State Highway Laboratory has been along these lines, and the speaker feels quite positive that contractors who have made a serious effort to comply with the requirements of their contract have had very little trouble with the laboratory forces. To properly carry out such a policy it is necessary to keep a very close supervision, not only of the materials being used, but also the manner in which these materials are incorporated into the pavement. Since the quality of the pavement depends upon the use of these materials in definite quantities, and the determination of these quantities is usually a laboratory process, it naturally follows that the control of the quantities required of these materials is just as much a laboratory function as is the determination of their quality.

In most localities the determination of the quantity of the different ingredients to be used in the preparation of a bituminous pavement is left entirely in the hands of the laboratory forces. This method of procedure has, no doubt, given the best results, otherwise it would not be so generally used. In some localities the same procedure is also followed in the preparation of Portland Cement Concrete pavements; that is, the proportion of the materials being used, and the methods followed in incorporating these materials into pavements are placed under the jurisdiction of the laboratory forces. This method should be universally adopted, for there is no doubt, in the speaker's opinion, that the preparation of this type of pavement should be under just as strict a laboratory control as the preparation of the bituminous types of pavement. The benefits that would thus be secured may not, however, be as great as has been the case with bituminous pavements, yet the quality of a concrete pavement, when so constructed, certainly would be superior to what is now generally being constructed.

To successfully use this method of inspection with a concrete pavement, the construction inspectors should be given such a course of training, both in the laboratory and in the field that will enable them to quickly determine the general character of the paving materials being used, and paving mixtures prepared therefrom. They should also have had sufficient field experience in the construction of this type of pavement to know how the paving mixtures should be handled and incorporated into the pavement to secure the best results. Such men ought to have had sufficient technical education, that, with a reasonable amount of training, they will be able to make all the tests required, read drawings, set stakes, etc., and to so use the information thus acquired that they will know when the pavement is being constructed in the manner required. In addition, they must be honest, ambitious, and possess an average amount of common sense. These latter requirements cannot be secured in college or in the field, yet they are very essential. It is safe to assume that those who do not have these natural qualifications will seldom make good inspectors, regardless of their education, training, or salary paid.

Since 90% of the actual construction of a pavement is under the supervision of the construction inspector, it is very important that this man should be qualified along the lines above designated, however, it is also very evident that a man who has had such a technical education and practical training cannot be secured at the salary usually paid inspectors. It is certainly false economy to assume that money is being saved by hiring a cheap inspector, for a single error in the construction of a pavement that is costing forty thousand dollars (\$40,000.00) per mile may decrease the life of the pavement 50%, or in other words, by such an error, which an incompetent inspector will not detect or correct, may cost the State twenty thousand dollars (\$20,000.00) per mile of pavement constructed. The amount thus lost on a single contract will pay the salaries of several well qualified inspectors for a number of years.



## General Discussion of Mr. Mattimore's Paper

COL. WHITTEMORE: I presume, in reference to the quality of materials, although it was not brought out particularly, that you have distinctly in mind that the quality of materials to be used in these various structures is not necessarily of the very best quality, but the best quality that is commercially available for the particular sort of undertaking. We do know there are certain kinds of sands very superior. It may be that it is like metals, as steel, for instance. In designing structures of this type, the speaker has had considerable experience, and can recall one undertaking where 30,000 tons of steel were used. Of course, they could have used a material that would have given higher results with smaller tonnage, but the cost would have been a great deal more than if using a different material not quite so strong. It is better to use the material commercially suited best to the undertaking, and I take it that the intention of these testing Laboratories is to determine of the material available, the proper proportions to give the desired results.

MR. MATTIMORE: Our aim, in the study of materials, is to utilize the most economical sources—these are selected after qualities have been determined, in that, we are seeking economy, not only in first costs, but in maintenance expenditure. Material testing and the interpretation of the same has approached the practical stage of seeking the most available supplies.

COL. WHITTEMORE: I think such work in road construction, if it is handled by an intelligent corps of engineers, analysts and inspectors, will be to the advantage of the taxpayers and the commonwealth.

MR. MATTIMORE: With respect to local materials; sand, procured locally, must be of the same quality as commercially produced sand. In stone, we would allow a small difference, but to date we never had to make this allowance.

MR. SPARKS: I would like to inquire if Pennsylvania has ever made any tests with a core drill or experimental tests where a central mixing plant has been used.

MR. MATTIMORE: No. We never used a central mixing plant in the State. We do not consider that this process is at the stage where we could safely use it, due to a tendency toward segregation.

MR. MATTIMORE: Relative tests of gravel and broken stone have been made. Frankly, I do not consider gravel as good as stone for use in concrete. In qualifying that, I do not say that I would not approve the use of gravel under certain conditions. Some states, if they could not use gravel, could not build highways, but we have found from all our tests, following up surface-wear tests in New York State for five years, that gravel was not as good as a good quality of stone.

COL. WHITTEMORE: I might cite a personal experience some years ago. We did not find as satisfactory results with the use of gravel as compared with the use of trap rock or broken stone for pavements 6 in. thick. I have no doubt that gravel can be used to make a good concrete pavement, commercially speaking, where it would be almost prohibitive to get satisfactory broken stone, but I do say that the mixture has to be different than it would be if good angular stone were available.

MR. GAGE: New Jersey appears to be quite fortunate in being well supplied with both stone and gravel in undeveloped and developed deposits. Naturally, it is a very live question whether gravel or stone should be used, since one can be produced at considerably less cost than the other. It is also to be expected that laboratory tests which favor one or the other of these materials will be severely criticised by the producers of the other. In this connection, I would like to state that there appears to be a tendency especially with Contractors and Engineers, to want laboratory methods and tests performed to a degree of fineness to about 99.9%, yet, when it comes to construction methods or products being produced, it is not uncommon to find a variation of 50% from requirements. To reduce laboratory tests to such a point of fineness when methods of construction are so loose is neither desirable

or economical. If the construction and producing methods were kept within very narrow limits, it might be that some of the materials now being used would be eliminated, but until such changes have been made, there is certainly no economy in using 100% material with a 50% method of construction.

If the materials to be used are to be determined by laboratory tests or services rendered by such material, then there appears to be no real reason why gravel should not be used in concrete pavements. One of the best concrete gravel pavements in the eastern part of the United States, which happens to be situated in this State, was built from  $\frac{3}{4}$  in. gravel; i. e., practically all of it would pass a 1.4 in. screen. Specimens taken from this pavement show it has a crushing strength on the average of over 4,500 pounds per square inch. To date, it is about seven years old and has given excellent service so far. Personally, I do not know of any single stone concrete pavement in New Jersey that has given any better service. No defects have developed in six years and it has not worn one-quarter of an inch during this period. It would be foolish to reject materials of the kind used in this pavement in view of the results secured both by laboratory tests and actual service in the field. It might be, if the methods of construction were so refined that they were practically 99% perfect, a pavement constructed from stone would give superior results to one constructed from gravel, but to date the writer does not believe that anything can be gained by the rejection of materials that are 75% to 90% good when our methods of construction are not over 50% perfect.

COL. WHITTEMORE: We all know that you can take a satisfactory quality of cement, sand, and stone, and one man will make a good road, and another man will make one that is worthless, out of the same materials. There is no question about that.

MR. NEWMARK: In using local stone, is there not a tendency on the part of the Contractor to try and use all sizes turned out on concrete jobs? It is my experience that there seems to be a tendency among Contractors to try and use all the stone produced. That would seem to be one of the disadvantages in the use of local stone. Should there be any wider latitude in sizes allowed in such cases, in Mr. Mattimore's opinion?

MR. MATTIMORE: No. The grading of aggregates is part of the design and the same respect should be shown for this as any other part of the specifications. The entire product of a crusher should not be used in concrete. A large proportion of commercial crushers have a waste, and the same conditions should be recognized in local crushers.

MR. NEWMARK: In ordering stone from commercial quarries the Inspector can more easily insist that the proper sizes be ordered and shipped. It costs the Contractor nothing. It is harder for the Inspector, however, to keep after the Contractor using local stone, to keep him from using unapproved sizes of stone. That I claim to be the disadvantage.

MR. MATTIMORE: Commercial stone producers calculate their waste in producing special graded products and include such in the costs. Experienced contractors working local supplies follow the same procedure. Therefore, when the inspector insists on grading to meet his specifications, he is only asking a contractor to fulfill a clause of his contract, and one that must have been estimated.

MR. KEASBEY: Do the results of strength tests of cores taken by the core drill show any distinction between the use of gravel and trap rock? Was there shown any appreciable difference in the results of the strength?

MR. GAGE: The variations between different jobs show on the average, I believe, that gravel has the best of it. I would not want to make any reflection on the use of either gravel or stone, for it so happens that gravel in one part of the State, especially in local contracts, has been more used than in localities where there is plenty of stone.

MR. MATTIMORE: It occurs to me that we are over-

estimating the value of the tests. The compression strength of concrete is not a very accurate measure of its value. It is a measure of its resistance to crushing, but it does not measure its resistance to wear or traffic stresses. Concrete made of different aggregates. The concrete with the highest compression strength is not necessarily the one that presents the greatest resistance to wear or traffic stresses. Concrete on one job may give a compression strength of 1000 pounds above another, and from a standpoint of wear resistance may not be any more efficient.

MR. BRAY: What have your tests shown of the difference between stone and gravel regarding abrasion?

MR. MATTIMORE: It is more of a surface impact. This starts as a rupture of the surface, then abrasion starts. Actual abrasion with rubber tires is very slight except where chains are used. Gravel has a tendency to spall out under impact more than the stone, and the smaller gravel more than the larger sizes.

COL. WHITTEMORE: I have noticed roads subjected to heavy steel tired wagon traffic. It makes a difference

whether the traffic is on stone or gravel. I have seen roads where the steel tired wagons had been used for several years and the dust and dirt from the tires was coming up and covering the road. The gravel concrete than on the hard trap rock, makes a great difference.

MR. MATTIMORE: Slag companies are trying to improve their product, and have a real desire to do so. If you understand the manufacture of slag you will realize that most of it is quite variable. We get slag from the grade that will float on water to that with a specific gravity of crushed rock. The lighter particles float to the top in a concrete road surface during finishing which accounts for the pitted surface often observed in slag concrete roads.

COL. WHITTEMORE: In Sussex County from the Canal Culvert at Ledgewood to Landing, at Lake Hopatcong, Morris County built a concrete road, and I believe it is slag concrete, at least I have been told so. (Mr. Gage interrupted at this point to inform the Colonel that it is slag concrete.) One notices that it does not have the smooth, even surface that is noticed with stone concrete.

## Contract News

Prepared by October 11, 1972

Jan. 11—Route No. 6, Section 8, Pearl St., Bridgeton. Reinforced Concrete paving job, 0.455 miles, 20 and 30 feet wide with gravel shoulders was awarded to the Tri State Construction Company, Bridgeton, N. J., on their low bid of \$76,302.36.

Feb. 8—Route 6, Section 5, Shirley-Oldman's Creek, Reinforced Concrete Paving job, 6.812 miles, 20 feet wide with gravel shoulders, was awarded to the Benjamin Foster Company, Philadelphia, Pennsylvania, on their low bid of \$254,021.53.

Feb. 16—Route 6, Section 6, Oldman's Creek-Mullica Hill, Reinforced Concrete Paving job, 5.028 miles, 20-30 feet wide with gravel shoulders, was awarded to the firm of M. Staub, Swedesboro, New Jersey, on his low bid of \$203,660.48.

Feb. 24—Route 14, Section 5, Cape May Court House to Swanton, Reinforced Concrete paving job, 2.987 miles, 20 feet wide with gravel shoulders, was awarded to the firm of Sutton and Corson, Ocean City, New Jersey, on their low bid of \$118,776.16.

Mar. 8—Route 6, Section 10, Quinton to Marlboro, Grading and Graveling job, 5.994 miles, 20 feet wide, with earth shoulders, was awarded to the Masterson Construction Corporation, New York City, on their low bid of \$79,793.17.

Mar. 8—Route 6, Section 11, Salem to Quinton, Reinforced Concrete paving job, 2.648 miles, 20 feet wide with gravel shoulders was awarded to Joseph F. Burke, of Plainfield, New Jersey, on his low bid of \$111,833.79.

Mar. 8—Route 4, Section 9, Smithville-Mullica River, Warrenite Bitulithic job, on concrete base, 3.748 miles, thirty feet wide, with gravel shoulders was awarded to C. H. Earle of Hackensack, New Jersey, on his low bid of \$374,533.77.

Mar. 8—Route 10, Section 1-B, Arcadian Way to Anderson Ave. in Fort Lee, Reinforced concrete paving job, 0.48 miles, 20 and 30 feet wide with earth shoulders, was awarded to the firm of John J. McGarry, Edgewater, New Jersey, on his low bid of \$104,362.61.

Mar. 15—Route 11, Section 1, Main Street, Passaic, Sheet Asphalt job, on Concrete Base, 0.257 miles, 22 feet, 2 inches wide, was awarded to Union Building Construction Company, Passaic, New Jersey, on their low bid of \$15,160.15.

Mar. 23—Route 4, Section 6, Eatontown-West Long Branch, Sheet Asphalt job on Concrete Base, 2.69 miles, 20 feet wide with earth shoulders was awarded to the Utility Construction Company of New Brunswick, New Jersey, on their low bid of \$149,679.74.

Apr. 4—Route 2, Section 3, South Broad Street Storm Drain job was awarded to A. G. Thompson, of Trenton, New Jersey, on his low bid of \$17,665.06.

Apr. 4—Route 2, Section 3, South Broad Street, Sheet Asphalt job, on Concrete Base, 0.648 miles, 48.5 feet wide, was awarded to J. J. Barrett, Trenton, New Jersey, on his low bid of \$69,433.77.

Apr. 12—Route 6, Section 9, Salem-Collier's Run, Reinforced Concrete Paving job, 4.752 miles, 20 feet wide with gravel shoulders was awarded to Sampson & Reuter, Elizabeth, New Jersey, on their low bid of \$196,975.08.

Apr. 15—Route 3, Section 8, Camden-Clements Bridge Road, Reinforced Concrete Paving job, 3.82 miles, 36 and 40 feet wide with earth shoulders was awarded to W. Penn Corson, Camden, N. J., on his low bid of \$269,644.85.

Apr. 15—Route 3, Section 9, Clements Bridge Road to Kirkwood, Reinforced Concrete Paving job, 3.756 miles, 29 feet wide with earth shoulders was awarded to John M. Kelley Construction Co., Camden, N. J., on their low bid of \$200,592.95.

Apr. 15—Route 3, Section 10, Kirkwood-Berlin, Reinforced Concrete Paving job, 5.576 miles, 29 feet wide with earth shoulders was awarded to John M. Kelley Construction Co., Camden, N. J., on their low bid of \$207,993.89.

Bridgeton, 1.314 miles long. Sheet Asphalt paving job on

ville, Warrenite Bitulithic on Concrete Base, 8 miles, 20 feet wide with gravel shoulders was awarded to the Tri State Construction Company, Bridgeton, New Jersey, on their low bid of \$1,000,000.

Apr. 18—Route 4, Section 11, Lakewood (County Section) 1.056 miles Reinforced Concrete Paving job, twenty-eight and thirty feet wide, was awarded to the Public Service Production Company of Newark, New Jersey, on their low bid of \$75,748.82.

Apr. 19—Route 4, Section 10, Skyway-Lower Rosell Avenue, Sheet Asphalt Paving job on Concrete Base, 2.41 miles, 20 and 36 feet wide with earth shoulders, was awarded to Newark Paving Company, of Newark, New Jersey, on their low bid of \$104,679.74.

Apr. 19—Route 1, Section 12, Sea Cliff Avenue, Reinforced Concrete Paving job, 0.162 miles, 20 feet wide with earth shoulders was awarded to T. H. Riddle, New Brunswick, New Jersey, on his low bid of \$8,672.73.

Apr. 21—Route 9, Section 6, Somerville-Bound Brook, Reinforced Concrete Paving job, 2.491 miles, 20 feet wide with earth shoulders was awarded to Salmon Brothers, Netcong, New Jersey, on their low bid of \$111,570.10.

Apr. 24—Route No. 1, Section 5-A, Storm Drain in Red Bank, was awarded to Chris T. Romano, Montclair, New Jersey, on his low bid of \$15,314.86.

Apr. 25—Route 5, Section 5, Madison Avenue, Madison Township and Borough of Madison Warrenite Bitulithic on Concrete base, 20.32 miles, 30 feet wide with earth shoulders, was awarded to the Northern Construction Company, of Newark, New Jersey, on their low bid of \$117,844.37.

Apr. 28—Route 4, Section 13, Richmond Ave., Point Pleasant Beach, Reinforced Concrete paving job, 0.848 miles, 20 feet wide with earth shoulders was awarded to C. H. Earle of Hackensack, New Jersey, on his low bid of \$15,471.76.

May 9—Route 9, Section 5, Union Avenue, Bound Brook, Sheet Asphalt on Concrete Base, 1.501 miles, 20 feet wide with earth shoulders was awarded to the Utility Construction Company of New Brunswick, New Jersey, on their low bid of \$93,090.31.

May 26—Route 4, Section 15, Lakewood (County Section) 1.056 miles Reinforced Concrete Paving job, twenty-eight and thirty feet wide, was awarded to the Public Service Production Company of Newark, New Jersey, on their low bid of \$75,748.82.

May 26—Route 4, Section 15, Lakewood (Township Section) 1.5 miles, Reinforced Concrete Paving job, 36 and 50 feet wide was awarded to C. H. Earle of Hackensack, New Jersey, on his low bid of \$105,741.10.

May 26—Route 9, Section 8, North Branch-Somerville, 3.837 miles, Reinforced Concrete paving job, 20 feet wide with earth shoulders was awarded to Ralph Sangiovanni, on his low bid of \$159,077.59.

May 26—Route 16, Section 3, Bedminster-Plukamin, 2.415 miles Reinforced Concrete paving job, 20 feet wide with earth shoulders was awarded to Ralph Sangiovanni, on his low bid of \$135,648.39.

May 26—Route 4, Section 16, Main St., Toms River, 1.096 miles long, Reinforced Concrete paving job, 20, 30, 36, 38 and 56 feet wide with gravel shoulders was awarded to the Public Service Production Company of Newark, New Jersey, on their low bid of \$62,864.59.

June 8—Route 5, Section 9, Barker's Corner-Hacketts-town, 2.99 miles Reinforced Concrete paving job, 20 and 48 feet wide with earth shoulders was awarded to Frank I. Groman, of Bethlehem, Pennsylvania, on his low bid of \$230,274.37.

June 8—Route 9, Section B, West Front Street, Plainfield, Sheet Asphalt paving job on Concrete Base, 1.929 miles, 40 and 41 feet wide, was awarded to the Union Paving Company, of Newark, New Jersey, on their low bid of \$219,116.20.

June 10—Route 6, Section 12, East Commerce Street

Apr. 18—Route 15, Sections 2 and 3, Bridgeton-Mill-

crete Base, 1.0 mile wide, was awarded to T. H. Riddle, New Brunswick, New Jersey, on their low bid of \$1,000,000.

June 20—Route 2, Section 3-A, Warrenite Bitulithic on Concrete Base, 0.589 miles, Reinforced Concrete paving job, 20 and 40 feet wide was awarded to J. S. Conner Sons of Newark, New Jersey, on their low bid of \$111,570.10.

June 21—Route 5, Section 6, Speedwell Avenue, Marlboro, Warrenite Bitulithic surface on Concrete Base, 1.497 miles, 21 feet, 3 1/2 inches wide was awarded to J. S. Conner Sons of Newark, New Jersey, on their low bid of \$111,570.10.

June 21—Route 9, Section 9, Phillipsburg-Still Valley, Reinforced Concrete paving job, 1.25 miles, 20 and 30 feet wide with earth shoulders was awarded to Crilly and Cannon of Phillipsburg, New Jersey, on their low bid of \$110,145.40.

June 28—Route 1, Section 6, Trenton City Line-Nottingham Way, reinforced concrete paving job, 0.928 miles, 19 feet, six inches wide, was awarded to Rees and Taylor, of Trenton, New Jersey, on their low bid of \$95,347.40.

June 28—Route 4, Section 11, Main Street, Avon, New Jersey, Warrenite Bitulithic surface on Concrete Base, 0.603 miles, 43 feet wide with earth shoulders was awarded to the East Jersey Bridge Company, of Perth Amboy, New Jersey, on their low bid of \$54,814.34.

July 7—Route 4, Section 17, Barnegat, Reinforced Concrete job, 1.0 miles, 20 feet wide with gravel shoulders, was awarded to the Public Service Production Company of Newark, New Jersey, on their low bid of \$43,931.91.

July 7—Route 1, Section 18, Tuckerton, Reinforced Concrete job, 1.5 miles, 20 feet wide with gravel shoulders, was awarded to the Public Service Production Company of Newark, New Jersey, on their low bid of \$50,911.83.

July 11—Route No. 11, Connecting link Route No. 1 and Route No. 12, Sheet Asphalt on Concrete Foundation, was awarded to the Franklin Construction Co., of Newark, New Jersey, on their low bid of \$10,000.00.

July 13—Route 9, Section 7, Main Street, Somerville, Reinforced Concrete job, 0.497 miles, was awarded to J. L. Bachman of Linden, N. J., on his low bid of \$74,180.25.

July 14—Route 16, Section 2, Mine Mount Road-Bedminster Corner, Reinforced Concrete job, 2.515 miles, was awarded to the Engineering Construction Corporation, Philadelphia, Pennsylvania, on their low bid of \$166,802.65.

July 17—Route 9, Section 9-A, Still Valley-Bloomsbury, Reinforced Concrete job, 2.92 miles, was awarded to Bernard E. Tighe Construction Company of Easton, Pennsylvania, on their low bid of \$127,785.84.

July 21—Route 5, Section 8, Great Meadows-Barker's Corner, Reinforced Concrete, was awarded to Salmon Bros., Netcong, New Jersey, on their low bid of \$186,688.69.

July 25—Route 1, Section 13, Highland Park-Stelton Road, Warrenite Bitulithic on Concrete Base, was awarded to S. S. Thompson & Company, Incorporated, Red Bank, New Jersey, on their low bid of \$305,394.61.

July 25—Route 1, Section 14, Stelton Road-Metuchen,

Warrenite Bitulithic on a Concrete Base, was awarded to S. S. Thompson & Company, Incorporated, Red Bank, New Jersey, on their low bid of \$141,784.79.

Aug. 6—Route 14, Section 4, Millville, Warrenite Bitulithic on Concrete Base, 0.936 miles, 20 feet wide, was awarded to the Tri State Construction Company, of Bridgeton, N. J., on their low bid of \$1,000,000.

Aug. 10—Route 6, Section 14, Woodbury, Reinforced Concrete paving job, 1.504 miles, 20 feet wide and 46 feet wide was awarded to the Public Service Production Company of Newark, N. J., on their low bid of \$169,775.88.

Aug. 18—Route 10, Section 3, Little Ferry-Ridgefield, Reinforced Concrete job, 1.76 miles, 20 to 30 feet wide, was awarded to John J. McGarry, of Edgewater, N. J., on his low bid of \$49,000.88.

Aug. 18—Route 10, Section 5, Hudson Street, Hackensack, Sheet Asphalt job, 1.449 miles, 20 ft. 4 in. and 4 ft. 6 in. wide, was awarded to G. M. Brewster, Tenafly, N. J., on his low bid of \$110,205.49.

Aug. 18—Route 10, Section 5-A, Essex Street, Hackensack, Reinforced Concrete Paving job, 0.346 miles, 22 feet wide, was awarded to Uthell and Phelan, Hackensack, N. J., on their low bid of \$11,313.99.

Sept. 15—Route No. 7, Section 1, Corlies Ave., Neptune Township, Warrenite Bitulithic on Concrete Base, 0.219 miles, 34 feet and 38 feet wide, was awarded to the East Jersey Bridge Company, of Perth Amboy, New Jersey, on their low bid of \$2,110.08.

Sept. 15—Route No. 4, Section 5-A, Maple Ave., Red Bank, Sheet Asphalt Paving job on Concrete Base, 1.308 miles, 40 feet wide was awarded to the Wm. P. McDonald Construction Company, of New York City, on their low bid of \$109,500.95.

Sept. 15—Route No. 9, Section 7-A, Union Ave., Grove St., Somerville, Reinforced Concrete Paving job, 0.778 miles, 20 feet wide, was awarded to the N. J. Construction Company, of Hackensack, N. J., on their low bid of \$77,549.47.

Sept. 15—Route No. 16, Section 4, Pluckamin-Somerville, Reinforced Concrete Paving job, 5.475 miles, 20 and 30 feet wide, was awarded to the Peconco Engineering & Construction Company, of New York City, on their low bid of \$329,749.09.

Sept. 15—Route No. 1 and 13, connecting link through New Brunswick, Asphalt Block Pavement on Concrete base, 0.873 miles, 37.4 and 45 ft. wide, was awarded to the Utility Construction Company, of New Brunswick, on their low bid of \$122,644.48.

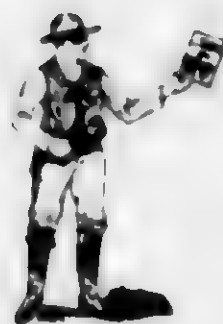
Sept. 28—Route No. 14, Section 7, Petersburg-Greenfield, Grading and Graveling job, 1.99 miles, 20 feet wide with earth shoulders was awarded to Ross & Whelan of Trenton, N. J., on their low bid of \$85,196.86.

October 11—Route No. 11, Passaic Avenue, Passaic and Clifton, National Pavement on Concrete Foundation, was awarded to P. S. Kramer, of Paterson, N. J., on his low bid of \$70,983.09.

October 16—Route No. 4, Connecting link-Perth Amboy, Sheet Asphalt surface on Concrete Base, was awarded to Graham & McKeon, of Perth Amboy, N. J., on their low bid of \$185,216.62.



# The Highwayman



## For You— "The Highwayman"

Do you use roads? Do you want to know where they are being built, and what detours to take, each month?

Then send, TODAY, to

**The Highwayman**  
New Jersey State Highway Department  
Trenton, N. J.

## Last Call for The Highwayman!

¶ The Highwayman, which heretofore has been sent without charge to any citizen of New Jersey, has now attained so large a circulation that it is impossible for us to continue its publication on this basis.

¶ We believe that the Highwayman is valuable enough to every automobile owner so that the majority of its readers will be willing to pay a small subscription price, rather than go without it. If this is so, the revenue from this source, together with that received from advertising, will enable us to continue its publication.

¶ The plans we have worked out for the coming year will make it even more valuable than it has been to every road user, and every one interested in road construction.

¶ The Detour Information alone, giving you, every month, accurate, right-up-to-date information about every detour in the state, is well worth the cost of a subscription—which amounts to less than one cigar a month!

**If You Want to Continue to Receive The Highwayman Send Us This Blank Today**

This is the last subscription blank which you will receive.  
**If You Want the Highwayman to continue VOTE YES with the ballot below,—and do it today!**

State Highway Department,  
Broad Street Bank Bldg.,  
Trenton, New Jersey.

Gentlemen:

I vote to have the Highwayman, and the Detour information Service, continued.

I enclose herewith \$1.00 for my subscription for the year 1923.

Name .....

Address .....

## MONTHLY BULLETIN OF DETOURS

Adopted by the New Jersey State Highway Commission

Corrected to November 18, 1922

*All detours posted with signs and blazed with "Arrows"*

Note:—The traveler will find poles banded along each route of the State Highway System to correspond to the colors indicating the direction of the routes.

Blue on the posts or signs indicates that the road is running North and South.

Red shows that it lies East and West.

While Yellow tells you that it takes a diagonal course Northwest and Southeast.

Brown indicates that it takes a diagonal course Northeast and Southwest.

**ROUTE NO. 1, Section 13—Highland Park-Metuchen.**

Detour south-bound traffic from Route No. 1 at Metuchen over Amboy Ave. and Main St. to Bonhamtown, thence over Piscataway Road to Highland Park. North bound traffic will be maintained through construction to overhead Pennsylvania Railroad Crossing to Middlesex Ave., Metuchen.

**ROUTE NO. 4, Section 5-A—Maple Avenue, Red Bank.**

Detour over Front St., and Broad Street.

**ROUTE NO. 4, Section 11, Avon-by-the-sea, under construction.**

No detour necessary. Traffic will go through construction.

**ROUTE NO. 4, Section 16—Toms River, under construction.**

Detour north of Toms River over Seward Ave., Hyer Ave. and Water St. in Toms River.

**ROUTE NO. 4, Section 17—Barnegat, under construction.**

No detour necessary. Traffic will go through construction.

**ROUTE NO. 4, Section 18—Tuckerton, under construction.**

No detour necessary. Traffic will go through construction.

**ROUTE NO. 5, Section 6—Speedwell Ave., Morristown, under construction.**

Traffic being maintained.

**ROUTE NO. 5, Sections 8 & 9—Between Great Meadows and Hackettstown.**

Detour at Hackettstown on Main St. to Mountain Ave. to Route No. 12, thence to Washington, Oxford Furnace, Buttzville, and Route No. 5, Belvidere and Delaware.

**ROUTE NO. 5, Section 14, Broad Street, Woodbury.**

Under construction from railroad crossing at north end of town to Red Bank Avenue. Detour over Westville-Glassboro Road to Cooper Street to Broad Street, Woodbury.

**ROUTE NO. 6—Mantua Ave., Woodbury, between Broad St., and present improvement south of Woodbury.**

No detour necessary. Traffic will go through construction.

**ROUTE NO. 6, Sections 10 and 11—Under construction between Salem, Quinton and Bridgeton.**

Detour from Salem through Hagersville, Hancock's Bridge, Harmersville, Canton, Gum Tree Corner, Town Hall, Kerns Corner, and Roadstown to Bridgeton.

**ROUTE NO. 9, Section B—Plainfield, under construction.**

Detour from Route No. 9 to Muhlenberg Place to West Second Street to Clinton Ave. to West Front St., or Route No. 9.

**ROUTE NO. 9, Section 7—Under construction, Borough of Somerville.**

Detour over Eastern Avenue and High Street.

**ROUTE NO. 9, Section 8—Under construction between Somerville and North Branch.**

No detour necessary. Traffic will go through construction.

**ROUTE NO. 9, Sections 1 and 2—Under construction between Perryville and West Portal Sections 9 and 9.A. Under construction between Bloomsbury and Phillipsburg.**

Detour via Clinton, Glen Gardner, Hampton, Washington, Broadway and New Village to Phillipsburg.

**ROUTE NO. 10, Section 1-B—Under construction between Arcadian Way and Anderson Avenue.**

Detour over Bluff Road to Anderson Avenue.

**ROUTE NO. 10, Sections 3, 5 and 5-A—At Hackensack and between Hackensack and Ridgefield.**

Detour just east of Saddle River on Rochelle Ave., to Passaic St., or Arcola Road to Main Street, Hackensack, to Fort Lee Turnpike to Grand Ave., Leonia, thence south over Grand Ave. to Ridgefield or North to Englewood. For points south of Ridgefield from Hackensack detour over Rochelle Ave. to Williams Ave. to Moonachie Road to Paterson Plank Road to Hudson Co. Boulevard.

**ROUTE NO. 15—Between Rio Grande and Goshen, bridge construction over Biddle Creek.**

Detour from Goshen to Cape May Court House and Route No. 14 to Rio Grande.

**ROUTE NO. 16, Section 2—Under construction between Mine Mt. Road to Bedminster Corner.**

Detour Liberty Corner Road to Liberty Corner thence to Lyons Station, and Basking Ridge to Blaziers Corner on Route No. 16.

**ROUTE NO. 16, Section No. 3—Between Bedminster Corner and Pluckemin.**

Detour from Route No. 16 over Far Hills-Lamington Road one and one-half miles southwesterly to first road leading in a southerly direction and parallel to Route No. 16, to Burnt Mill Road to Pluckemin.



## COUNTY DETOURS

In addition to the information concerning detours on account of State Highway construction, the following information is issued to advise the public of all construction on roads within each County and also to give an account of the different detours to be used in connection with this construction work. Detours are marked with directing signs and arrows.

### ATLANTIC COUNTY

**Downtown-Mays Landing Road under construction.** For Atlantic City and Mays Landing from Downtown detour south on Lake Road to Wheat Road; thence northeast on Wheat road to Buena and Hammonon; thence east to Egg Harbor City; thence south for Mays Landing or continue east for Atlantic City.  
For Richland detour from Buena south over the Tuckahoe Road to Richland Road.

### BERGEN COUNTY

**River Road, Borough of East Rutherford.** Detour over local streets.  
**Railroad Ave., Ridgefield Park.** Traffic being maintained.

### BURLINGTON COUNTY

**Mt. Holly-Medford Road.** Traffic being maintained.  
**Chester Ave., Moorestown, under construction.** Detour over Oak Ave., Stanwick Ave. to Bridgeboro Road.

### CUMBERLAND COUNTY

**Landis Ave., Section 1 from Carll's Corner to Salem County Line.** Detour over Bridgeton Ave., and Rosenhayn Road.

### ESSEX COUNTY

**Central Ave., Caldwell, under construction.**  
Detour Mountain Avenue, Greenbrook and Pier Lane.

### GLOUCESTER COUNTY

**Mantua-Glassboro Road under construction.** Detour at Mantua over Route No. 6 to Union St. to Wenonah and over Woodbury, Glassboro Road to Glassboro.  
**Delaware Street, Woodbury, under construction.** Traffic being maintained.  
**Crown Point Road one-half mile south of Westville under construction.** Detour local roads.  
**Chestnut Branch Bridge on Barnesboro-Sewell Road under construction.** Detour from Barnesboro to Pitman via Richwood Road or to Mantua over Sewell-Mantua Road.

### MERCER COUNTY

**White Horse-Yardville Road under construction.** Traffic being maintained.  
**River Road from Scudder Falls to Washington's Crossing under construction.**  
Traffic being maintained.

### MIDDLESEX COUNTY

**State Street, Perth Amboy.** Traffic being maintained.

**River Road between Highland Park and Bound Brook under construction.** Detour over road south side of Raritan River.

### MONMOUTH COUNTY

**Oceanport Ave., Long Branch to Oceanport under construction.** Detour via Wolff's Mill and Elkwood Park to Oceanport.

### MORRIS COUNTY

**Long Valley-Hunterdon County Line Road under construction.** Traffic being maintained.  
**Passaic Ave., Chatham under construction.** Detour local streets.  
**Main St., Wharton, under construction.** Detour over Dover-Woodport Road.

### PASSAIC COUNTY

**Cherry Lane, Hawthorne, closed between Wagarau Road and Diamond Bridge.**  
Detour Lincoln Street and Washington Avenue.

### SALEM COUNTY

**Pennsville-Salem Road under construction.** Traffic being maintained.  
**Elmer-Centerton Road under construction.** Traffic will be maintained.

### SOMERSET COUNTY

**Watchung Avenue, Borough of North Plainfield, under construction.**  
Detour local streets

### SUSSEX COUNTY

**Monroe-Hamburg Road under construction.**  
Detour by the way of Sussex for traffic from Franklin or Hamburg to Branchville.  
**Ross's Corner, Sussex Road, under construction near Sussex.** Detour Beenerville Road and Branchville road.  
**High Street, Newton, under construction.** Detour over Main St., Liberty St., Linwood Ave., Thompson St., West End Ave., and Ridge Road to first road leading to right to Fredon-Newton Road.

### UNION COUNTY

**Hillside Avenue, Liberty Avenue and Salem Road in Hillside and Union Townships under construction.**  
Detour over local streets.  
**Walnut Avenue between South Avenue and Lehigh Valley R. R. tracks, Cranford Township, under construction.**  
Detour Union Ave., Lincoln Ave., Denman Ave., Rahway Ave., and Lexington Ave.  
**Springfield Ave., New Providence under construction.** Detour South St., and Central Ave.  
**Mountain Ave., Westfield, under construction.** Traffic being maintained.

### WARREN COUNTY

**Washington-Buttsville Road under construction from Buttsville Mill to State Highway Route No. 6.**  
Traffic is being maintained.  
**Hope-Blairstown Road under construction.**  
Detour from Square in Hope to Yall and over Hainesburg-Blairstown Road to Blairstown.



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New Jersey State Highway Department  
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# The Highwayman



Route 3, at Harborton Lake

**The Highwayman Is Out  
For More and Better Roads  
in New Jersey**

November, 1922  
Vol. II  
No. 4



## I Am the Motor

I have clipped the wings of Time; and broken through the barriers of Space.

I have opened the gates of the cities, that those who dwell therein may go as on wings to the open spaces, and find again the sun and the wind and the stars they had forgot; and watch the passing pageant of the seasons—spring mornings that burn with a green flame in the meadows, and summer nights beneath the cool arch of the silent stars, and autumn afternoons, with a dying glory on hill and sky.

In the busy marts by day, your ear has heard my whirring in a thousand streets. Because of my presence the wheels of industry spin faster;

the work of the world is done in shorter hours.

Through the stretches of the night you have listened to my rumble over the long dark roads, bearing the barter of city with city—the machine that is needed in a hurry, the repair part that is holding up the work of a hundred men; the daily food supply of millions. Over a thousand long roads I rumble on.

I have given much; and one thing have I asked—roads. Flowing roads for my spinning wheels; roads to reach into the humble corners, and stretch even to the far places of the earth. So that I may go safely and with speed, and bring my gifts everywhere, and to all.

—F. F. R.





# The Highwayman of New Jersey

## The Highwayman

Published Monthly By The  
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### THE HIGHWAYMAN

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Executive Secretary	EDWARD W. O'BRIEN

## If You Want The Highwayman You Must Act Today!

Last month's issue contained an announcement to the effect that the circulation of the Highwayman had grown to such an extent that it would now be necessary to charge a small subscription price for it, if publication was to be continued.

If you want the Highwayman to continue to bring you, month by month, complete information about the roads of your State, and a monthly Bulletin of Detours, send in your subscription today.

If we receive subscriptions enough for the year 1923, the Highwayman will be continued. If not, its publication will be suspended. Should the publication be suspended, all unexpired contracts for advertising will be adjusted, and all subscriptions which have been received will be refunded.

## "Bigger and Better Than Ever!"

That's What Lee And Charlie Are Saying About This Year's Convention.

"Are you going?"

"Of course I am; d'ye think I'd miss it?"

That's what you hear all along the line, in reference to the Highway Department Convention to be held February 14, to February 17.

We have yet to find the party—and there were over five hundred of 'em!—who attended last year's convention, that did not feel they got their time and money's worth.

### Equipment Men, Take Notice!

In addition to the regular program of talks on all kinds of road matters, for all sorts of road workers, there will be the big Exhibit of Equipment and Materials.

Spaces for this Exhibit are being allotted in the order of application. There is no other way of getting your machinery or materials so directly before all the road men in the State—and a good many from other States—as to show them here. Reserve your space today!



Frederick D. Woodruff

Assistant Superintendent of Maintenance

Fred Woodruff claims the distinction of having been born October 13, 1892, on a farm at or near Somerville, N. J. We don't know just what he means by "on a farm" in Somerville, because by all accounts, Somerville is a real town. However, we will take Fred's word for it.

After attending Grammar and High School in Somerville, he started his engineering career with the County Engineer of Somerset County in 1910, continuing in this position until 1914. From 1914 to 1915, he was employed by Richards & Gaston, Inc., in subway construction on the Brooklyn Rapid Transit. A portion of 1915 was spent with the New York Connecting R. R., at Long Island City, doing drafting work.

In 1915 Fred came with the Highway Department as an Inspector. He continued this work until 1917, at which time he volunteered for services with the 104th U. S. Engineers. Fred went across with the A. E. F. as Lieutenant, and returned to the department in 1919, being assigned to the Maintenance Division, as Assistant Superintendent of Maintenance. If you want to know anything about the state of progress of maintenance work, furnishing and delivering of material or anything else along that line, ask Fred, he knows.

He is the kind of a chap that does not make a lot of trouble about handing out necessary information to those who need it, and consequently wins the respect and liking of all with whom he is associated, or comes in contact with.

Fred is married and has two daughters. He says that he does not belong to any organizations, never received any medals or otherwise distinguished himself beyond the lot of the ordinary individual who sits in the house by the side of the road—a friend to every man.

## Ready For The Battle

Snow!

We don't think much about it 'till we get it—we being the users of autos.

But the boys up in Trenton have been thinking about it for weeks. They know that, if the roads are to be kept open for the public, the equipment, the organization, and the spirit to do that job, must be ready in advance.

Snow removal is not like road building, that can be done as other work is done. It is more like fighting a fire—you don't know when the alarm will come in, or where it will be, or how serious. The only way is to be ready for any emergency, any time, any where. And the biggest reward of the man who goes out, at midnight perhaps, to fight the driving blizzard that seems bent on tying up a state's road traffic, is the knowledge of the SERVICE they are performing for the public.

The "snow removal" work is handled by a volunteer organization of the employees of the Highway Department, with the co-operation of the contractors.

It is under the immediate direction of Assistant Highway Engineer, Ed. Reed, who would rather stay up all night and battle with the Snow Giant, than eat or sleep—at least, he has been known to do just that.



Alex W. Muir

Superintendent of Maintenance

Alex. Muir might impress the casual observer as being one of the department's prize grouchers, after one had been put on the wrong end of a telephone connection, when Alex. got up steam. He is the fellow, you know, that is relied upon to keep communications open with distant points of the State when an ice storm breaks down the telephone wires, and we don't expect that he will use Radio, either, as the boys claim that it will only be necessary, to get him interested and then open the window. Aside from these misleading characteristics, Alex. is one of the most popular men in the department, and is really very human.

He accomplishes what he undertakes, and large credit is due him for the condition in which our State Highways and Detours are maintained. Alex. is the sort of a fellow that would tell you that results obtained were the result of the efficiency of his assistants and associates, but his assistants and associates would say that his strict adherence to his "knitting", good common sense, and the spirit of harmony which he instills in those associated with him, is responsible for the results.

Alex. says he was born in East Orange on July 2, 1886, and attended private schools until 1899. We assume that there was a slight gap between 1886 and 1899 when Alex. didn't go to school, but he forgot to mention that. He graduated from Newton (New Jersey) High School in 1902; attended Peddie Institute in 1902 and 1903. After his first experience at Peddie, he worked in the wholesale hosiery business, in New York City in 1903 and 1904. We can't imagine Alex. being in the hosiery business, but he says it's a fact. He resumed his studies at Peddie Institute again in the year 1904, 1905, and 1906, graduating in June 1906. Graduated from Brown University in 1910, with the degree of Bachelor of Science and Civil Engineer. Worked with A. H. Konkle, County Engineer of Sussex County during the summers of 1908 and 1909, and from the time of graduation from Brown University, until September 1911. Worked with Salmon Brothers, Contractors, during 1912 and a portion of 1913; May 1913 to June 1917 with F. W. Salmon, County Engineer of Warren County.

He entered the employ of State Highway Department in June 1917 at Camp No. 1-B, Layton, N. J., on inmate labor work. Served with Twenty-Third Engineers, U. S. Army from December 9, 1917, to June 17, 1919. With A. E. F. in France from April 1918 to latter part of May 1919. He returned to the State Highway Department on July 1, 1919, being assigned to the Maintenance Division. On Aug. 30, 1920, he was made Acting Superintendent of Maintenance, and on Oct. 1, 1921, was appointed permanently to that position.

He was among the first to receive his license from the State Board of Professional Engineers and Land Surveyors, having received license card No. 22, and being licensed to practice as a Highway Engineer.

Alex. is not married, and while we are not running a matrimonial bureau,

## NEW JERSEY STATE HIGHWAY DEPARTMENT

August 1, 1922

Executive

HON. EDWARD I. EDWARDS, Governor  
The State Highway Commission

and

THOMAS J. WASSER, State Highway Engineer

ADMINISTRATION

A. LEE GROVER, Secretary and Chief Clerk

M. L. HOWELL - Chief Auditor and Accountant

CHAS. FISHER - Assistant Chief Clerk

R. W. WILDBLOOD - Purchase Clerk

MISS GRACE WILLIAMSON - Chief File Clerk

### CONSTRUCTION DIVISION

C. F. BEDWELL, Construction Engineer

G. R. MOORE, Asst. Construction Engineer

R. A. MEEKER - Right of Way Engineer

JOHN L. VOGEL - Bridge Engineer

THOMAS GEORGE - Supervisor of State Labor

C. A. BURN - Northern Division Engineer

H. D. ROBBINS - Central Division Engineer

J. A. WILLIAMS - Southern Division Engineer

L. F. HALL - Chief Draftsman

### PROJECTS DIVISION

EDWARD E. REED, Assistant State Highway Engineer

A. D. BULLOCK - Projects Engineer

H. C. SHINN - Engineer of Special Assignments

### MAINTENANCE DIVISION

ALEX W. MUIR, Superintendent of Maintenance

F. D. WOODRUFF - Assistant Supt. of Maintenance

E. M. STORER - Chief Inspector

### EQUIPMENT DIVISION

JACOB HAGIN, Superintendent of Plant and Equipment

N. C. APPLIGATE - Asst. Supt. of Plant and Equipment

J. J. TYMAN - Asst. Supt. of Plant and Equipment

F. M. DEVEREUX - Asst. Supt. of Plant and Equipment

### TESTING LABORATORY

R. B. GAGE, Chemical Engineer

J. G. BRAGG - Senior Testing Engineer

F. H. BAUMANN - Senior Testing Chemist

## A Reversed Current

Prior to the late war, American road builders went to Europe to study the methods and types of construction used by engineers on the other side. Our text books on roads also were based largely on European practice. Every speech made by an American highway builder back in the nineties referred in glowing terms to the old Roman roads and to the excellent European macadam construction.

The situation now has been completely reversed by the road surface required to withstand motor vehicle traffic. But European engineers have been slow to change their methods of construction. The war had a good deal to do with this. The natural European conservatism evidently has been the main factor, however, in the retention of the methods and types of construction that stood up under slow-moving, steel-shod traffic.

American highway builders consequently no longer look to Europe for leadership on types and methods of highway construction and surfacing. Much still could be learned from Europe in the way of careful work and methods of maintenance. But the fast, economical American methods of building concrete and brick roads, and concrete base for other surfacing, have been very little used abroad until lately.

Last year a few road engineers from Europe came here to study our methods. This season at least 250 highway builders from abroad have come to see how we do it. Many of them have gone home only partly convinced that American methods are right. Few with whom we have come in contact will adopt right off our methods and the machinery required to make such methods economical.

Sooner or later engineers of other countries will come to realize that the vast program of construction in this country has made it possible to develop the best known methods of road building. The tide of visitors which already has set in from abroad then will grow rapidly and the United States will replace Europe as the mecca for the road builders of the world.—Successful Methods.



# The Highwayman of New Jersey



**"Joe" Tyman**  
Assistant Superintendent Plant and Equipment.

Joe is the man who says "yes," or "no," (after you have made an appointment with some important official at a distant point from Trenton) as to whether or not you can fill your engagement. Of course, it sometimes falls his lot to inform you that no automobile is available for your use. This is only done, however, after every possible means at his command has been exhausted to furnish the needed transportation.

There are times when the Equipment Division Office resembles a train dispatcher's office on a railroad, with half a dozen accidents blocking the main line. Between the truck drivers, passenger car drivers, and mechanics in distress, Joe has been known to be busy trying to answer two or three telephones at once. Such circumstances are not conducive to a sweet disposition, but Joe maintains a pretty even keel, even in a heavy storm of trouble. Joe says that his life, up to and before his connection with the Equipment Division of the State Highway Department as Assistant Superintendent of Plant & Equipment, was fairly happy.

He admits being born in Pennington, New Jersey, on September 3, 1892. When eight months old, he moved to Trenton and has been here ever since. He attended the Public and Parochial schools of Trenton, and Rider College, (nights).

Joe started out with C. V. Hill & Co., Refrigerator Manufacturers of Trenton, in various capacities, Mechanic, Foreman, etc., and left them to go into the Automobile business as Service Manager in a garage. He next went with the U. S. Emergency Fleet Corp., at Bristol, Pa., as Asst. Supt. of Equipment, Materials & Salvage Department. Was there three years, leaving this position to accept position with the New Jersey State Highway Department, May 25, 1920.

## How They're Doing It In Canada

With a view to minimizing the danger of accidents, a list of "Rules and Courtesies of the Road" will probably form an integral part of the new license for motor drivers which the Ministry of Transport intends to produce.

The principal of these rules are:—  
Drive carefully and considerately.  
Never obstruct the free passage of the highway.  
Permit faster vehicles to overtake you.  
Drive as close as practicable to the left of the road.  
Do not stop on bends or corners.  
Do not reverse in congested thoroughfares.  
Pass on the right or off side in overtaking other vehicles.  
Never overtake at cross roads, or at bends of the road or down steep hills.  
Give audible warning of approach whenever necessary.  
Strictly observe all official road warning posts and signs and the direction of the police.

## Safety Lesson by Miss Anne Rogers Sterling, Colorado, Wins First Honors in National Competition

A safety lesson by Miss Anne Rogers, a teacher in the public schools at Sterling, Colorado, designed to instruct children in safe behavior on the streets and highways, won first honors in the national safety lesson contest conducted in 1921 under the auspices of the Highway Education Board.

Miss Rogers' lessons was considered the best of approximately 40,000 to 50,000 lessons submitted by teachers of the nation. Her success entitles her to five hundred dollars and a trip to Washington, D. C., with all expenses paid.

The second best safety lesson was prepared by Miss Teresa M. Lenney, New Rochelle, New York, who received three hundred dollars. Two hundred dollars was given Miss Ida G. Ale, Trenton, New Jersey, who submitted the third best lesson.

The lessons by Miss Rogers, Miss Lenney and Miss Ale were first chosen as the best from their respective states, and submitted in competition with forty-nine other lessons, the best from each state and territory, for the national prizes offered by the National Automobile Chamber of Commerce.

Judges of the fifty-two state and territorial lessons were William Phelps Eno, Washington, D. C., President Eno Foundation for the Regulation of Highway Traffic; Dr. Thomas E. Finegan, Harrisburg, Pennsylvania, State Superintendent of Public Instruction for Pennsylvania, and W. J. Funk, New York, N. Y., Vice-president Funk & Wagnalls, publishers of the Literary Digest.

Miss Rogers' lesson follows:

### A LESSON ON SAFETY TAUGHT IN CONNECTION WITH CIVICS WORK

#### Introduction

My class has been discussing the topic, "How the community aids the citizen to satisfy his desire for transportation", in the development of the lesson, the main thought developed was, "There could be no community life without good highways."

Upon questioning, the information was brought out that the public highways were not rendering the best possible service. Our improved means of transportation have increased speed, reduced the cost of commodities, brought the states of the Union closer together, but at what cost! The cost of lives, of limbs, of physical illness and mental anguish. Thus the introduction to a lesson in safety education was made possible and easy.

#### Teacher's Aim or Object of Lesson

1. To help the children realize the dangers that confront them in their play, work and everyday activities.
2. To show them what carelessness and ignorance cost in lives, injuries, health, happiness and progress.
3. To help them acquire habits of safety that will eliminate loss of life and limb.
4. To help them to help others to acquire these safety habits also.

#### Presentation

In order to arouse an interest in the topic, I asked the children to bring to class a story of an accident. They were to discuss the story according to the following outline:

1. Kind of accident.
  2. People involved (age, etc.)
  3. How the accident happened (causes).
  4. Results of the accident.
  5. How the accident could have been avoided.
- The recitation brought out the following information:
1. Almost every child had been in some sort of an accident.
  2. The greater number of accidents had been caused by:
    - a. Speeding in automobiles.
    - b. Riding bicycles on the sidewalk.
    - c. Running instead of walking across streets.
    - d. Hooking on to wagons and cars with sleds, etc.
    - e. Jay-walking on the highways.
    - f. Getting on and off street cars in the wrong manner.

- g. Glaring head-lights on cars.
  - h. Failure to keep to the right.
3. Old people, middle-aged people and children had been in the accidents, but the greater percentage were children.
  4. Many of the accidents had resulted in death, injury, physical illness from fright, and in many cases had cost a man his job.
  5. Accidents could have been avoided if the people had not been careless and ignorant of traffic rules.

Mr. Hunter, a "safety first" man, employed by a railroad, was requested to give a talk on "Safety First Methods." During the course of the talk, he showed, by means of statistics, that the accidents on various railroads were decreasing every year because safety first methods were being used. He said that accidents to pedestrians and automobile drivers were increasing each year because they had not learned to think "Safety first."

The pupils were greatly impressed by his talk and his figures, and by stories of accidents that he had investigated. I dismissed my class that day with one question: "What Should You Know in Order to Avoid Accidents?"

The next day when the class came in, every one was ready with suggestions. One boy had a copy of the traffic regulations for the county and state, and suggested that each member of the class become acquainted with them, which they did, with him presiding as chairman, reading them and asking for explanations and suggestions from the class.

Another boy had his Scout manual from which he read the regulations to be followed in regard to safety and asked his classmates if they would pledge themselves to support these regulations. They did.

One girl had taken statistics from her class and found that eighty per cent of all the children were law-breakers; without exception the children all had jay-walked; seventy-five per cent of those who owned bicycles rode them on the sidewalk. There were only a few who had not "hooked" rides on cars or wagons.

The children became so interested in these statistics that they carried the figures into their arithmetic class and worked out a socialized problem in arithmetic on loss of life and limb as shown by city, state and national statistics. The main point gained by the lesson showed that the greatest number of people who were injured were pedestrians, i. e. in 1920, 1,000 occupants of automobiles were killed and 10,000 pedestrians were killed.

This knowledge awakened them to the realization that they as individuals and as pedestrians had a definite part to play in this "safety first" campaign, if the highways were to be made more safe.

At the end of the recitation, I asked the following question:

#### "What Must You Do to Make the Highways More Safe?"

The next day each pupil brought a list of the things that he could do in order to make the highways more safe. Each one offered information on the subject, and a list of do's and don'ts was compiled by the class. Many of the rules they had learned from their own experience, others they had gotten from fifty large posters that I had hung in the room, showing results of "short cuts" and why it was better to practice safety first. Other facts came from books on safety education which I had ready for their use. These books were: "Sure-Pop and The Safety Scouts", "Safety for the Child", "American Book of Golden Deeds", "Prevention of Accidents and Safety Education" and "Twelve Lessons in Safety for the Automobile Driver."

The Safety First list compiled is as follows:

- I will not play in the street.
- I will not ride a bicycle on the sidewalk.
- I will not play in the railroad yards.
- I will not jump on wagons or cars.
- I will not run in front of street cars or automobiles.
- I will not hold an umbrella in front of my face while crossing the street.



## Rattle Snake Gives Road Inspector Battle For Life

County Engineer Ferguson Views Dead Reptiles—  
Largest Seen in Midvale

From up in the Erskine section of Midvale Borough comes the story of a bitter fight between John McMullen, a state road inspector, who resides in Paterson, with two six-foot rattle snakes, which attacked him from two sides, while he was covering his beat Saturday morning. County Engineer Garwood Ferguson of Paterson, who saw the dead reptiles a few hours after the battle, said that they were the largest he had ever seen.

According to the story McMullen nearly stepped on one of the snakes, when the latter coiled and made a lunge for his chest. He stepped aside just in time to escape certain death when his vision fastened on the mate, which was creeping toward him about fifteen feet away. Fortunately there was a club handy with which he dispatched the two terrors of the hills before they succeeded in doing him bodily harm. Police Chief Harry Post of Midvale, while in the Paterson court house yesterday morning, told of having witnessed the killing of an eight foot rattler with eleven buttons, on the main road near Redner's hotel situated above the overhead crossing in Midvale, last Friday. The snake was sunning itself in the roadway when a heavy truck happened along and ran over its body. Natives in the upper section of the county cannot recall a season when so many rattlers have been killed as in the summer just ending. Although rattlers have always been known to exist in the mountains extending from Pompton to Greenwood Lake, they were scarcely seen except in the remote sections. Just what has caused them to breed so abundantly this season no one seems to know. If they continue to breed as rapidly in the next few years as in this, the rattle snake will be regarded as one of New Jersey's domestic venomous snakes. At the present time there are only two poisonous reptiles in the state, the copperhead and the black snake.

I will not cross the street in the middle of the block.  
I will not stand in the street while waiting for a street car.  
I will look in all directions before crossing a busy street.  
I will wait for the policeman's signal.  
I will help younger children on the highways.  
I will keep to the right at all times.  
Each pupil pledged himself to practice these safety rules until the rules had become a habit and a part of their every day lives.

The question I asked for the next day's assignment was: "How Can You Help Others Establish These Safety Habits?"

In the development of the lesson members of the class decided that if they did the right thing, others would soon

(Continued on page 14.)



# The Highwayman of New Jersey



Showing the recent improvements made on Sugar Hill Road, which runs directly from Atlantic City to Penns Grove.

## Sugar Hill Road, Atlantic County, New Jersey

The accompanying photograph of a reconstructed section of the direct road between Atlantic City and Penns Grove (Wilmington) was taken at the extreme westerly end of the improvement looking eastwardly, and it shows the diverting of the road from its previous location over a grade crossing, which latter has been moved eastwardly to secure a better approach, improved vision and, generally, a much safer crossing. Previous to the reconstruction of the road, the travel to and from Atlantic City used the abandoned grade crossing along with another one about a mile to the east, and both of these are now eliminated for through Atlantic City travel; the grade crossing, as relocated, is used by travel to and from Ocean City.

The reconstruction of the road, including a new bridge over Babcock's Creek, was completed about August 1, 1922, by Sutton & Corson Co., on the road items, and S. S. Thompson & Co., Inc., on the bridge items. The road is

Warrenite-Bitulithic on a concrete base and the bridge is pile trestle of creosoted lumber throughout.

The banking of the curve, which deflects the road from its former location from the grade crossing, is well shown together with guard rail, drainage provisions, and other details; the re-located grade crossing appears in the distance and the new bridge is just beyond the crossing. Acceptance of the work marked the completion of a long continued effort on the part of Atlantic County authorities against considerable opposition on the part of local interests; the splendid improvement is now greatly appreciated by all concerned, and the State Highway Department is highly commended for its co-operation with the County in the undertaking, the work having been done under State-Aid contracts.

ALEXANDER HOWARD NELSON,  
Atlantic County Engineer.

## "My Guide"

Among the papers belonging to one Thomas Van Alstyne an engineer graduate of Cornell University, who was killed in the discharge of his duties, were these rules of conduct which he had drawn up and entitled "My Guide."

"My Guide" is so good, I am taking the liberty of reproducing it. It might very well be "My Guide" for a very great many of us. Here it is:

Loyalty. To respect my country, my profession and myself. To be honest and fair with my fellowmen, as I expect them to be honest and square with me. To be a loyal citizen of the United States of America. To speak of it with praise and act always as a trustworthy custodian of its good name. To be a man whose name carries weight wherever it goes.

Service. To base my expectations of reward on a solid foundation of service rendered. To be willing to pay the price of success in honest effort. To look upon my work as an opportunity to be seized with joy and made the most of, and not as a painful drudgery to be reluctantly endured.

Ambition. To remember that success lies within myself—in my own brain, my own ambition, my own courage

and determination. To expect difficulties and force my way through them. To turn hard experiences into capital for future struggles. To believe in my propension heart and soul. To carry an air of optimism in the presence of those I meet. To dispel ill temper with cheerfulness, kill doubts with a strong conviction, and reduce active friction with an agreeable personality.

Study. To make a study of my business. To know my profession in every detail. To mix brains with my efforts and use system and method in my work. To find time to do every needful thing, but never letting time find me doing nothing. To hoard days as a miser hoards dollars. To make every hour bring me dividends, increased knowledge, or healthful recreation.

Elimination. To keep my future unmortgaged by debts. To save as well as to earn. To cut out expensive amusements until I can afford them.

Growth. Finally, to take a good grip on the joys of life. To play the game like a man. To fight against nothing so hard as my own weaknesses and endeavor to grow in strength as a gentleman, a Christian.

So I may be courteous to men, faithful to friends, true to God, a fragrance in the path I tread.



This shows the condition of the road between Red Bank and Middletown (Route 4) before it was taken over by the State Highway Department

## How Some Contractors Might Improve Their Work

We asked Harry Robbins "what in your opinion could the State Highway Contractor have done this year to improve the progress and quality of his work?" This is what he said:

The construction season of 1922, the largest in the history of the State, has been a trying one to the contractor as well as to the engineer. Shortages of labor and materials, difficulties of transportation, delays in shipments, and so on are a few of the difficulties with which they have had to contend.

We will endeavor, in this brief article, to point out some of the things the contractor should do to facilitate the progress and improve the quality of his work.

Few contracts are secured without a bid submitted, and here's where some of the trouble begins. There are 57 kinds of ways in which a contractor can lose money on highway work, and his bid is one of them. He's beaten before the flag drops. Careless estimating and failure to analyze the many factors entering into a highway contract, and to anticipate to some reasonable degree the fluctuation of the market in the different materials required has given many a contractor a bad start, has disheartened him, and the job has suffered in consequence. Nothing succeeds like success, and an intelligent bid is one of the elements of success.

All plants and equipment should be in first class condition at the beginning of the season. All equipment should be overhauled during the winter or other slack time; that unfitted for service discarded; that worth repairing given careful attention, and worn and damaged parts replaced. The wants of the coming season should be anticipated, and orders for new machines placed far enough in advance that no delay in construction work may be caused by tardy delivery. The manufacturers will

thank you for that, and the engineer will call you blessed. A complement of spare parts should always be on hand. Then a break of a minor part means but a few hours delay instead of days. The right machine for the work may mean progress.

Material orders should be placed early, and by early we mean as soon as practicable after the award of contract. First come, first served, with the material men, so they say. Make careful estimates of amounts of materials required, and follow up the shipments that delivery may be regular. Of course, in some cases, strikes, fires, earthquakes and other acts of Providence will militate against you, but at least you can keep your nose clean. Then, too, the quality of materials. Be assured that they meet the specifications, and buy with that end in view. The Department will thank you if you notify promptly of the source of supply. Inspection of materials is essential but sometimes overlooked by the contractor.

The matter of organization is often slighted. Efficient superintendents and foremen mean much to the quality and quantity of the work. Employ skill-d labor where skilled labor is required. Don't send a boy to do a man's work. Well paid, contented labor means efficiency and increased output. Better for the contractor, better for the State.

Mode of procedure and laying out of plant is as important in highway work as in any other construction. We have seen an otherwise promising contract delayed by no reason, and profits turned into losses through poor planning of mode of procedure and laying out of plant. When the successful operation of the entire work depends upon the layout, is it not wise to give much thought to this matter?

(Continued on page 12.)



This shows the condition of the road, at approximately the same points, after being paved with modern, durable hard-surfaced pavement.

# The Highwayman of New Jersey



Route 12, Section 2, showing the old and new alignment looking west towards Fox Hill.

## National Road Building Forced by a Vast Increase in Motor Transport

By Ben. M. McKelway, "Trained Men"

Industrial America, outstripping in its rapid development the railroad facilities of the country, has found that the answer to a serious question of transportation lies in the motor vehicle. Last year it carried six times as many passengers, and 87 per cent as much freight as all the railways of the United States combined.

But in the solution of one problem, another and a graver one has been created. The railroad first builds its roadbed and then adds its rolling stock. In highway transport, the American public finds itself today in possession of more than 10,000,000 motor vehicles, representing an investment nearly four times greater than the amount spent in the last 10 years to provide a roadbed for that rolling stock. In the last 11 years the increase in motor registration has been 1,800 per cent., but the effective expenditures for road building for a corresponding period show only a 400 per cent. increase.

There is but one answer to this second problem—there must be a National Program for Building Highways. One is already in a fair way of being established through what has become a fixed policy for Federal aid to States. It involves the expenditure of billions of dollars for the construction of thousands of miles of good highways, and for the employment of trained men over a long period of years. Out of it has come the Roosevelt National Highway, with its 3,368 miles from the Nation's Capital to Los Angeles; the Lincoln Highway, extending 3,323 miles from New York to San Francisco; the Dixie Highway, 2,308 miles from Calais, Me., to Florida's favorite Miami; the George Washington, from Savannah to Seattle; the Mississippi Valley, the Pacific, the King of Trails from Canada to Texas—all of these but the beginning of a plan to lace America together with ribbons of brick, asphalt, and concrete.

Systematic road building in this country is newer than motor transportation. Expenditures from 1900 to 1910

were negligible, but since then the states, with Federal aid, have invested approximately \$2,526,000,000 in their highways. In 1910 the automobile industry was just getting on its feet; that same year saw the first boom in road building, the States expending about \$120,000,000. Two years later, the Government began its financial participation, appropriating \$2,000,000. The following table strikingly showing the increases from year to year since 1917, includes Federal funds:

Year	Expenditure
1904	\$ 59,527,170
1914	240,261,784
1917	279,915,332
1918	286,101,198
1919	389,455,932
1920	500,000,000
1921	767,000,000
1922 (estimated)	772,000,000

"The utility of the motor vehicle to a large extent is dependent upon the improved highway," says Thomas H. MacDonald, Chief of the Bureau of Public Roads of the Department of Agriculture. Mr. MacDonald has been called "the greatest spender in the country." Through his hands pass the millions appropriated by Congress for distribution among the states.

To illustrate that the vehicle and the highway are one and the same problem, he tells a story which might be labeled, "The Penny and the Cream for the Oatmeal." "We have a coin of the realm, known as a copper cent, which is not greatly respected," he says.

"Our milkman drives a rather large truck. As I come down the stairs in the morning, I see that he has deposited on the front porch our daily portion of milk. Now I am particularly fond of what comes on top of that milk, and do not consider a day well begun unless I have oatmeal and cream.

# of New Jersey



Route 4, Section 2-A, between Hackettstown and Drakestown

"I figure that to me, as an average American citizen, the cost of the highway in transporting that milk, which I consider essential to my well being, is this little-respected penny, and the highway cost of all the rest of my food which is transported over the roads is nothing at all!"

"That was the cost of the American highways to the individual man, woman, and child in this country last year, after deducting the exact revenue which the automobiles contributed in fees to the road built. The amount deducted does not include any of the intangible income from motor vehicles. Perhaps I am not exactly accurate, the cost may be about one and one-tenth cents, as near as we can estimate it. It does seem, therefore, that we can afford the highways.

"I have contemplated the poorest child in the poorest tenement district in New York City, wondering if we could decrease to him the bill of our American highways. Can we consider that to him—or to any one—the tangible personal benefit from our American highways is worth at least one copper cent per day for the transportation of food he eats.

Efficient transportation is necessary for the nation's existence. And the advent of motor transportation has put it, with the railroads and with the waterways, as a necessity. The problem concerns all, for all use the highways. To quote President Harding in his first message to Congress, "The motor vehicle has become an indispensable instrument in our political, social, and industrial life."

Have you ever thought just how indispensable an instrument the motor car really is?

Last year, according to figures compiled by the National Automobile Chamber of Commerce, the motor car carried 6,990,862,000 Americans over an area aggregating 70-820,000,000 miles. Motor trucks at the same time were carrying 1,430,000,000 tons of freight of every conceivable description over 6,479,200,000 miles. Three million automobiles and trucks are found today on the farms of the country. One hundred thousand doctors rely on the motor car to carry them back and forth on their errands of mercy. Last year something like 50,000 school children

were transported in motor buses, while 135,000 suburbanites were chiefly dependent on their cars to take them to and from their daily work.

Within the last 20 years farmers have gone further into the remote rural sections, their motor trucks establishing a connecting link between food production and the point of marketing. Records of the Department of Agriculture indicate that in many cases the farmer's haul to market has been increased from 6.5 to 17.6 miles, an expansion based entirely on motor truck haulage.

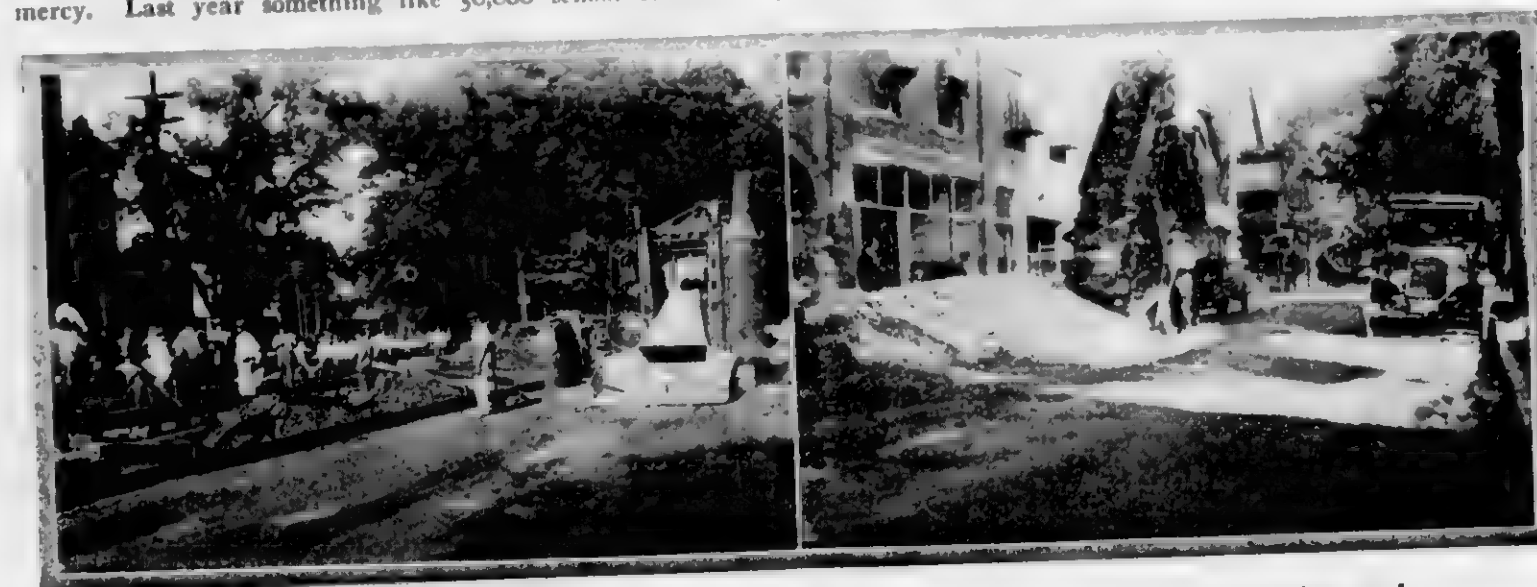
The city man has gone far into the suburbs to escape the baneful effect of living in offensive, in many cases unhealthy, contact with factories. Conditions in any city show its central portions are being driven more and more to commerce and manufacturing, and that the residential section constantly moves further and further into the suburbs.

So much for some of the accomplishments of motor transportation in a half score of years. But what of the future? Mr. MacDonald says the utility of motor transportation is dependent upon the improved highway. What must we do to expand this utility?

"It is possible," Mr. MacDonald points out, "to comprehend something of the physical and financial undertaking involved in the completion of a great building or a great bridge, because each may be within the range of vision. But who can adequately picture to himself the immensity of the highway improvement demands now being made within the United States, to say nothing of those of our territorial possessions? No other nation has ever undertaken to supply adequate transportation facilities to an area of over 3,000,000 square miles. France has an area of 212,654 square miles, Germany 208,780, while the borders of Texas alone enclose 262,398 square miles. Our states are empires in their extent, and the whole future of this nation will be largely modified and determined by the factor of transportation, including in this sense, all forms of interchange, as we today have them and know them. "There are no precedents from which we may accurately estimate the total cost of pro-



Darker's Corner at Hackettstown. (Route 5, section 9) and construction work being done at that point.



Construction on Main Street, Summerville (Right) loading stone on trucks for paving work.



# The Highwayman of New Jersey



Route 5, Section 2, between Budd Lake and Drakestown

viding necessary improved highways, but the financial aspects are even now so large as to demand the most careful and scientific policies which may be determined. As the costs accumulate from year to year, the increasing demands upon the financial foundation will cause failure unless Government policies are properly determined and planned for the future.

"No reason can be offered for not planning well for the future, for we are yet near the beginning of highway building activity in its major sense. There are not the same uncertainties that confronted the railroad builders. The early railroads were built largely on the strength of prospective and to an extent problematic traffic. The highways are being built for a traffic already waiting.

There are plenty of evidences that the taxpaying public is rapidly nearing the end of its ability, or at least of its willingness, to act further in the capacity of a shock absorber. Too many public enterprises have been saved from bankruptcy only by calling on the public treasuries for additional funds to wipe out the deficit between estimate and cost, between income and outgo. There is no reason why the highways should not be placed in the self-supporting class. They are not a luxury nor an incidental, but one of the indispensable facilities to all phases of the life of the nation and of the individual. The highways are possessed of a real earning capacity, and this must be recognized, collected, and credited to them."

The present Highway Building Program, entertained by the Bureau of Public Roads, contemplates 180,000 miles of roadway, of which funds for the construction of about 71,000 miles, or nearly 40 per cent of the total, have been made available. No time has been set for the ultimate realization of this national program.

If the Federal Government is willing to spend \$50,000,000 a year, it may take 20 years. If Uncle Sam can spare \$75,000,000 from the Federal treasury each year—assuming the states will pay 58 per cent of the total road-building cost—the job can be completed in 15 years. If the United States Government is willing to spare \$100,

000,000 a year, assuming the states bear their proportionate cost, the work can be done in 10 years.

The Highway Building Program contemplates a national system of roads. Motor transportation has made this a necessity. The time has passed when the Federal Government will appropriate funds for the states to spend as they please in improving and building their own inter-county or town-to-town systems. We have passed the stage when one community can be considered, and reached the point where the country as a whole must come within the program.

When the 180,000 to 190,000 miles of road contemplated are completed, they will connect practically every county seat in every state, and will also connect at state borders with those from other states. Eventually, it should be possible to drive from any county seat in one part of the country to another like point in any other part of the nation without leaving a Federal-aid highway.

Apparently Federal aid to the states has become a fixed national policy, for on June 19 last, President Harding signed the Post Office Appropriation bill, authorizing an additional fund of \$190,000,000 for that purpose—\$50,000,000 being authorized for the present fiscal year which began June 1; \$65,000,000 and \$75,000,000 respectively, for each of the two succeeding fiscal years. It is estimated that this \$190,000,000 will result in the construction of more than 25,000 miles, which, added to the 46,000 miles expected to result from previous appropriations, makes a total of 71,000 miles, or nearly 40 per cent of the estimated 180,000 miles of road in the Federal-aid system now being outlined. To match the \$287,500,000 of Federal funds involved, the states have appropriated \$380,000,000, making a grand total of \$667,500,000.

There is, perhaps, no wider field for specialized employment in industrial America today than that which has been opened by the impetus given to highway construction. It has been reflected so far in the amount of attention being given by federal and state highway commissions to increasing and improving their personnel. The volume



A View From Route 5, Hackettstown-Drakestown Road

and character of motor-driven traffic today has rendered obsolete much of the so-called science of road building. Only recently has any attention been given to the importance of highway transport in its relation to highway engineering and highway economics.

The problem created by the lack of trained men to carry out the vast road building program of the future, and to adapt it to the new science of highway transport, has brought about the formation of the Highway Education Board, which was created to recommend courses in highway engineering and highway transport, and to undertake researches into the problems presented in highway engineering and transport.

For the year 1921 '22, this committee learned by a recent survey, that 8,709 students were listed in 114 schools as preparing for civil engineering. Of 1,870 who were members of the senior class, more than one-fourth or 503, had indicated a desire to specialize in highway engineering. Only 48 out of the 114 schools reporting permitted or indicated special courses in highway engineering.

Suppose, by a generous estimate, we double the number of seniors last year who actually testified to their desire to specialize in highway engineering. There would be around 1,000. A pitiful small supply to meet an ever growing demand!

Lewis W. McIntyre, Assistant Professor of Civil Engineering of the University of Pittsburgh, and a member of the Society for the Promotion of Engineering Education, calculated recently that there is already a demand for 9,600 men with engineering training employed by highway bodies in the United States outside of county and municipal organizations. Of this number 10 per cent. are needed as replacements each year.

In addition to technical knowledge the highway engineer must know the fundamentals of practical road building. He must have a fundamental knowledge of the motor vehicle, and a fundamental knowledge of methods of highway transport. His field is virtually unlimited.

The highway transport engineer must solve the problems of the future in motor transport, must anticipate the trend and direction of city and suburban traffic, must know how to relieve congestion resulting from the steady increase in rolling stock. He must know the limitations of the motor vehicle, be familiar with its mechanical upkeep, its operating economics, and its adaptability. He must solve the problems of the community or the group of shippers employing him and be able to tell what roads should be improved. He must select the best routes, the best equipment, and he must reduce the operating costs for owners of motor truck fleets.

The rapid growth of the motor industry has far outrun the number of available trained men, and the future of this, now the second largest industry in the country producing the finished article, is limited only by the actual production of motor vehicles and the construction of good roads.

The time will come when the one road cannot serve the speeding passenger car and the lumbering motor truck. Separate roads must be built between congested centers to serve both speeds. Our cities, built with their short corners and crooked streets to serve the slow, horse-drawn traffic of another era, must eliminate their rapidly increasing street congestion by the construction of private rights of way, improved terminal facilities for fleets of trucks, and by the designation of heavy and light traffic streets.

The men to bring about this great development are here. As the pioneers of a generation or two ago, who with grim and unhesitating valor packed their belongings into covered wagons and took their families with rifle and dog, out into the open, they are ready to pioneer a new age. But to their number must be added others who must be summoned to this pioneering of a new industry, and must be trained for this tremendous, noble calling.

For "the cause of the highways is everybody's business, because it is everybody's benefit."



Concrete mixer in action on Summerville North Branch road. Route 9 Section 8 (Right) Truck dumping concrete aggregate into mixer on the job.



Greenwood Avenue, Trenton, showing pavers laying stone blocks between trolley tracks (right) intersection of Route 1 and Nottingham Way in City of Trenton, about one block from the entrance to the Interstate Fair grounds. Close cooperation between the State Labor Division and the Contractor was necessary to get this job completed in time for the Fair traffic.

## Prevention of Accidents

Employees of the State Highway Department as well as Contractors and Contractors' employees, may read with interest an article on the above subject in the August issue of the *Contractors' Atlas* by H. G. Lewis, Jr., Editor, *Engineering Accident Prevention* and Editor of the Portland Cement Association, extracts from which are quoted herewith.

Accident prevention is a dream that has come true. It is no longer a far-fetched dream dreamed by some to protect and safeguard their men and by educating them to be more careful. A lot of the employees said it was impossible—couldn't be done. A lot of employers laughed at the idea—but the dreamers kept at it. They showed employers that safety was a moral obligation toward their workers, and that accidents were a needless expense to the firm; these dreamers showed the workers that a full complement of eyes, arms and legs was a moral obligation they owed their families who depend upon them for support. It was a good idea and the pretty part of it was that it worked. Accident prevention is not a dream now—it is a fact and employers and men who do not practice it are blind to the humanitarian and financial advantages that come with it.

Accidents, whether they happen on the street, in the factory or on your contracting job, constitute a menace to the general well-being of us all. The efficiency of any organization depends in part on the elimination of the demoralizing occurrences such as the accidental killing or injuring of employees.

The complexity of the world in our day does not allow us to put our mind to sleep with the thought that what does not happen to ourselves does not concern us.

When an accident happens there is damage to pay directly in dollars and cents, and we all share in the payment of the load that must be added to the price of our products.

Prevention of accidents is first of all a humanitarian duty and furthermore, it is good business. Possibly the smallest loss is that which shows up under direct payment on the compensation claim. Demoralizing of the working force with consequent decrease in production is likely to be of greater financial importance to the contractor and builder. Particularly on the smaller job is this fact outstanding. If on a job of 10 men one is injured, the job is just 10% under-manned and possibly even more actual.

(Continued from page 7.)

Each part of the work should have its time of completion and be completed somewhere near to schedule. An allowance for weather and tardy delivery of materials taken into consideration. Otherwise, how would the contractor know if he is to complete within the time specified in his contract. The old days of beginning with the cross drain and ending with the slopes and shoulders, and heavens send us an extension of time are past. The modern contractor is essentially a business man and his work must be carried on in a business-like manner.

The slighting of construction details is the thorn in the engineer's side. It is this one thing more than any other that ruins many an otherwise excellent piece of work.

The contractor's attention and the attention of his subordinates should be always directed to those details too insignificant in themselves, yet so greatly do they effect the finished work. Much excellent material has been spoiled by improper use. We will not mention these details here for they are an old story. What excuse can the contractor offer for this neglect?

It is the contractor's duty to familiarize himself with the requirements of the plans and specifications, and to see that his superintendents and foremen do likewise. Many times we have heard the old story "didn't know it was the specifications." It was once upon a time supposed that no one but the man who wrote things could interpret their hidden meaning and he wasn't sure. Don't leave it all to the inspector. Let the contractors have their men study the specifications, perhaps they will find something they did not know was there.

There is a danger to the man who is on when the motor vehicle is waiting at a danger point. In order to develop a proper safety campaign for the motor vehicle, it is necessary, for the work itself is suggestive of the kind of possible accidents. It is plain that proper and substantial equipment must be provided which possesses a good safe factor. Even a man's clothing must be given attention, for many a man has lost a hand by reason of wearing a gauntlet glove, and others have lost arms and life because a loose sleeve or glove dangled into revolving drums or gears.

A dangerous machine is a potential liability which sooner or later becomes a real one if not remedied. The same is true of a careless man and where uncorrected hazards exist there are quite sure to be careless men, because the careful ones don't stay, they can't afford to. They go where they are reasonably protected from accidents.

By a final analysis we come to the conclusion that there are only three elements entering into any accident.

The three elements are Men—Methods—Material. The three "M's" in our safety school as the three "R's" in our grammar school, form the foundation for all future activities. With the three "M's" we may even make a finer division, and claim that there is only one "M" entering into all safety work and that "M" stands for Men. Methods are determined by Men, and material is placed by Men, whether the method or material is of the right kind depends upon the man applying it.

If 200 men are working on a job, 200 men must co-operate if accidents are to be prevented. One man's carelessness and lack of co-operation may spell injury and death to many.

## The Right to the Right of Way

If every automobile driver will adhere strictly to the code of giving the car on the right, the right of way, many of the fatal automobile accidents that shock the readers of the daily papers every day can be avoided.

This is the opinion of Dai H. Lewis, acting executive chairman of the American Automobile Association.

Says Mr. Lewis, "The rule of the road, both in the city and in the open country, is that the driver on the right has the right of way, and there should be a severe punishment for any person who violates that rule."

"The increasing number of automobiles that congest traffic in the cities brings more and more to the front the question of right of way. Most cities provide in their ordinances that the A. A. A. system of giving the road to the man on the right except on through boulevards, shall be effective, but unfortunately it is not always observed. There is always the fellow who is willing to 'take a chance' in order to display his driving skill, or to 'show off' before some fair companion and this type of driver should be the target for every policeman's attention."

"Automobile driving should be a pleasure. There is seldom an occasion where extreme haste is necessary, and the motorist loses mighty few seconds in observing the rights of the man on the right. After you reach the hospital or morgue, it doesn't matter much who had the right of way, but a little patience would avoid many a run for the ambulance, and many an operation for the surgeon, as well as considerable physical pain for the driver who forgot to consider the other fellow's right to the right of way."

## Highway Widths

It is quite possible that we are even yet far from adequate future requirements. True, there are many assertions and certain concrete evidences that this country has about reached the saturation point of motor passenger vehicles, but quite clearly we have not reached the saturation point of industrial vehicles and trucks. We probably attained to a maximum of about 100 million passenger cars and we believe that the 20th century will have reached for ordinary standard cars. As we are inclined to think that each case requires a different width, we need special study and determination. The 100 ft. right of way wider pavement will continue to increase, but there will probably be many instances of narrow pavements and of separate pavements carrying separate traffic.

In common with many others, the editor used to think that 66-ft. and 100-ft. rights of way for public highways involved unreasonable extravagances. In common with many others, he has changed his mind. The 100 ft. right of way for main highways the greater widths are clearly necessary. Not only should there be a wider width to permit of the widening of pavements and segregation of traffic, but hereafter be necessary to permit of more control and control and beautification. The 100 ft. right of way is today proving a blessing in many instances where it was once decided.—*Road and Street News*.

## Tests Disclose Where Motorists Waste Gas

Washington, D. C.—Most motorists fail to get as much mileage as possible out of the gasoline they consume because they have never learned to operate their cars properly. The common practice of waiting to shift gears on hills until the car has almost come to a stop is one of the principal causes of waste of gasoline. According to the Bureau of Public Roads this fact is shown by tests conducted by Prof. T. R. Agg of Iowa State College in co-operation with the Bureau under the auspices of the National Research Council.

The tests were made primarily to discover the effect of various kinds of highway surfacing material and different grades on gasoline consumption. The conclusion with reference to faulty driving is merely incidental to the tests, but it is one which will mean money in the pocket of every man who drives a car if the advice of the Bureau is heeded.

The vehicles used in the tests were equipped with an ingenious device which makes a continuous record of the gasoline consumed as the vehicle moves over the road and another which makes a simultaneous record of the speed at every instant. Suitable sections of road were selected for the tests and the exact grades of these sections were determined. The specially equipped vehicles, both trucks and automobiles, were then driven over the various sections taking the records of the gasoline consumption and speed with the two instruments described. Several trips were made over each section, and the rate of fuel consumption and speed for each trip were plotted on a graph with the profile or grade of the road. It is these diagrams that show the effect of delayed shifting of the gears on hills.

Exact instructions for the most economic driving will

## Disgraceful Village Streets

There are 14,450 "incorporated places" in America. Of these 14,450 cities, towns, and villages, only 1,800 have a population of 1,000 people each, and the 12,650 "rural places" contain 9,000,000. Nearly all the "rural places" of the 12,650 "rural places" live on unpaved roads, and the same holds true of a large percentage of the residents of "urban places." There are no statistics to show how many miles of streets there are in the 14,450 "incorporated places", so that we can not estimate accurately the percentage of unpaved streets.

Even without such statistics to indicate the extent of unpaved streets, it would be evident enough to anyone who travels much that most of our small towns are very inadequately paved. Mud half the year and dust the other half are characteristics of their streets.

When we grow unduly elated over our progress in paving our highways such facts as these should bring us to earth, yes, literally to earth—to the dirt streets, that are typical of most of our small towns and villages, and, also, of many of our larger cities.

We read repeatedly of overproduction in this, that or the other sort of industry. There are too many coal mines, too many iron furnaces and mills, too many motor car factories, too many textile mills, too many farms, too many stores, and so on through nearly every sort of productive and distributive business. It seems rarely to occur to anyone that such excess capacity of production exists solely because of failure to direct capital and labor into enterprises where there is an excess of latent demand over the present supply. By latent demand we mean potential demand, demand that may not exist at the present moment but that can be easily aroused by proper educational and publicity efforts. There is unquestionably a great latent demand for better streets and roads, for most of our highways are not only a disgrace to us, but a very great economic burden, because of their disgraceful condition.

Is it not "up to" the civil engineers of America to lead the way in arousing the latent demand for improved highways? Are they not the logical propagandists of all economically needed public works?

We believe that most civil engineers would reply affirmatively, yet continue to act negatively. Money is needed both for economic investigation and for educational propaganda. Engineering societies have too little income even for their needs. How, then shall they form public opinion when it costs much money to do so? The answer appears to be that engineering societies must solicit funds for such purposes from public spirited men of wealth.—*Road and Street News*.

## Maybe It's the Exception Which Proves the Rule!

"Figures won't lie," declared the statistician. "Maybe you are right," answered the mild-mannered citizen.

"And yet, somehow, I can't put implicit faith in the numbers that go up on a taxicab register."



(Continued from page 5.)

do it also. That was the first step to take. Next they must warn little children and others of dangers on the highways, explaining to them why they should cultivate habits of safety. They decided to try to break the bad habits of the pupils in the school by establishing safety patrols during Safety Week, both inside the building and on the highways around the building.

One day, before this campaign started, I had the city photographer come to the school house and take pictures of the pupils passing to and from classes, and as they were dismissed at noon. When these pictures were developed, I brought them into class and hung them by the side of the posters on "Safety First." You can imagine their excitement when pupils found they had been photographed riding bicycles on the sidewalk, jay-walking, running, and passing with a great deal of confusion in the hall. Naturally they were all pleased to find that the other fellow had been caught, too. They took these pictures from room to room in the building, and showed to the pupils in the other grades the risks they were running every day and gave a short talk on the safety campaign, telling them the object of it, how they could cooperate, and about the safety patrol that was to be in the halls and on the school highways to help them to break their careless habits and acquire safety habits. Of course, they gained the hearty cooperation of the rest of the school.

Traffic policemen were appointed from among the pupils to take posts at the doorways, steps, and hallways to guide the children as they came into the building in the morning and at noon, and as they passed to and from classes, and when they were dismissed. The duty of the traffic policeman was to see that all pupils walked down the steps one step at a time, to prevent congestion in the halls, and also to explain to any who disobeyed these rules the danger to themselves and others.

Outside the building the traffic policeman's duty was to see that no one rode bicycles on the sidewalk, that no one jay-walked, that all kept to the right, and observed the general safety code.

The school building is very centrally located, and before

long the safety patrol began to attract the attention of passersby. Upon several occasions citizens were asked to cooperate with the safety committee. Before the week was over every adult knew that he was being watched in his movements on the highway, and it was surprising to hear the favorable comment that came to us from various sources. Many citizens were made to feel that an example was being set by the younger people, which they were in honor bound to follow.

The photographer came again to the school at the end of the safety campaign and took pictures at the same places. When these were developed we hung them on the other side of the safety posters, and when each child had pledged himself to keep the safety regulations and to acquire safety habits, so that the highways could be made more safe, the first pictures of confusion and lawlessness were removed.

It is one thing to have knowledge and another thing to know how to use it. Almost all of the information brought out in this lesson was information that the majority of the children already knew. However, it was not organized in their minds, and it had not been impressed upon them that their failure to use this information was making the highways unsafe.

The lesson in safety education helped the children to organize their material, taught them how to use this information, and how they could play a definite part in making the highways more safe.



## A Slogan

Bite off more than you can chew,  
Then chew it.

Plan for more than you can do,  
Then do it.

Hitch your wagon to a star,  
Keep your seat and there you are!

—Pittsburg Christian Advocate.



In front of Seaview Golf Club, near Atlantic City, (Route 4)

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**H**ALF a century ago the railroads reached out into the wastes of the continent—tapped reservoirs of undeveloped wealth—lifted the pall of isolation from frontier life.

Today improved highways are completing the work that the railroads then began—are doing for individual districts what the railroads did for the country as a whole.

The old-time "isolated community" is rapidly vanishing. In its stead are seen progressive towns and villages—centers of ever-widening circles of business activity. This is the magic of good roads.

Nor are the benefits confined to towns and villages. Good roads make farming more profitable. They bring

to the farmer and his family greater social advantages and better educational facilities. They make farm life more attractive.

Yet with all their blessings, good roads need not be expensive. Whether for residential streets or country highways, Tarvia is the quickest, surest, most economical way to all-year roads, free from mud, dust and ruts and proof against water, frost and traffic. It is a coal-tar product made in grades to meet every road condition.

One Tarvia road in your community will prove to you and your townspeople how good roads, with all their benefits, can be had at low cost.

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Glutrin has been manufactured by us in our own plants for over 15 years. We have our own tank car line in which to deliver the product. The material used in New Jersey was applied by Mr. M. R. Young, Trenton, N. J., with pressure distributors especially built to handle this product.

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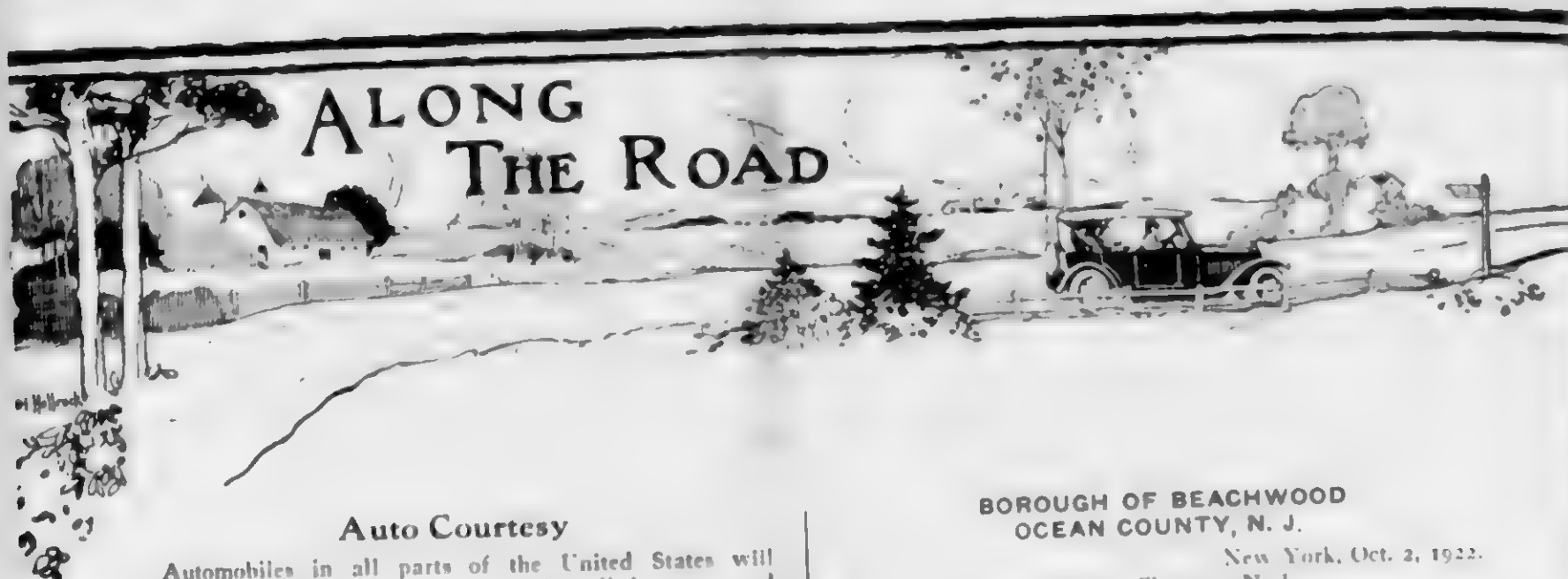


Edison Cement for All Seasons

## EDISON PORTLAND CEMENT

Used Exclusively in Construction of This Road

**EDISON PORTLAND CEMENT COMPANY**  
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### Auto Courtesy

Automobiles in all parts of the United States will soon be bearing on their windshields a little green and white sticker with "AUTOMOBILE COURTESY" in large letters over the name of the local automobile club indicating that the driver of this car is observing the courtesy campaign being conducted by the American Automobile Association in connection with the Chicago Automobile Trade Association and the National Automobile Dealers Association.

"We believe that 50% of the automobile accidents which happen on the highways of the United States could be avoided through the use of a little automobile courtesy," said Dai H. Lewis, Acting Executive Chairman of the A. A. A. "Courtesy costs nothing and brings greater results than any other element entering into the driving of an automobile."

"Real automobile courtesy demands that we give the other fellow his share of the road; that we dim our lights when meeting another car at night; that we recognize the fact that the man behind us blowing for the road wants to get by and is not challenging us to a race; in short it means being agreeable in all these little things that go so far toward avoiding friction."

The American Automobile Association in taking up with its three hundred affiliated clubs the question of carrying on this campaign is impressing the need for careful observance of traffic regulations as one of the elements of a courtesy campaign. The traffic officer, the Association points out, is only a human being placed in a difficult position because of the necessity of enforcing these regulations, and a little courtesy toward him will eliminate many of the more trivial arrests that now clutter up our traffic courts.

The whole operation of the courtesy campaign, the A. A. A. points out, depends entirely upon the old principle of the golden rule, "Do unto others as ye would that they should do unto you."

*"Slowly and sadly we laid him down  
And we spoke not a word of sorrow."  
He told us before he'd surely have  
His brake bands fixed—tomorrow.*

—Bay City Motor News.

### BOROUGH OF BEACHWOOD OCEAN COUNTY, N. J.

New York, Oct. 2, 1922.

State Road Commissioner, Trenton, N. J.  
Dear Sir:

I wish to take this opportunity of expressing the appreciation of the people of Beachwood, Ocean Co., N. J. to the way your Department has main'tained the State Highway through the Borough of Beachwood. It is the best piece of road of this kind, (gravel road) that the writer has seen anywhere and it has been favorably commented on by a great many people.

Yours very truly,

(Signed) EDWIN D. COLLINS  
Mayor of Beachwood, N. J.

E. D. C.

### Good Reason For It!

We heard the other day of a contractor who stopped in the office of a State Highway Department and remarked to the Chief Engineer that he did not seem to be quite as tall as the contractor had pictured him. "No," replied the engineer, "I have been recently married and have settled down quite a good deal."—*The Juniata Company News.*

### Good Roads Have One Drawback

It's nice to live in the country—nice for your city relatives when the auto season gets in full swing. It's pretty hard for a country cousin to get out of reach of the auto.

### It's a Real RARA AVIS, All Right!

A prospective buyer walked into the garage and said to the proprietor: "I would like to see a first-class second-hand car."

The proprietor looked at him, and smiled as he replied: "So would I, brother."—*Jack-O-Lantern.*

On the Sabbath so drive your car that when the roll is called on Monday morning you can say, "Glory be, I'm still here."—*Akron Motorist.*



This shows the relocation of Route 5 on the side of Schooley's Mountain near Hackettstown. Even the photograph gives some idea of the wonderful scenes along this road. No wonder the Sunday traffic is heavy!